

If, like many students and teachers, you find creating properly formatted bibliographies a chore, perhaps you should consider using bibliographic software.

Personal Bibliographic Software

**Part One:
PBMS software on
the Macintosh
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Acknowledgements:

Thanks to Easby Ho for her assistance in editing this issue.

Publisher

University of Toronto Computing Services
Toronto, Ontario
Canada M5S 1C1

Editor: Patricia Hood

Publications Assistant: Maureen Monné

Publication Date: April 1, 1990

Subscriptions

Subscriptions run for one year, beginning each January. Changes should be entered on the form at the back of this issue and mailed to *ComputerNews*, 4 Bancroft Avenue, Room 217 (or phone 416-978-4034). FAX: (416)978-7159.

ComputerNews is published eight times yearly by the University of Toronto Computing Services (UTCS). Enquiries should be directed to:

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Unless otherwise indicated, network addresses appearing after the author's name pertain to NetNorth/BITNET/EARN.

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CD-ROMs Now

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The CD-ROM (Compact Disc Read Only Memory) was introduced in early 1985. Though five years have passed since its debut, many people still know relatively little about the CD-ROM. The wealth of information resources found on CD-ROMs is useful in many disciplines and is the main reason for the increasing number of CD-ROM workstations on campus.

What are CD-ROMs?

Before the CD-ROM, there was the audio Compact Disc (CD) used primarily for music playback. Once the computer industry realized the potential of the tremendous storage capacity in the disc itself, the CD-ROM was born. Like the CD, the CD-ROM is read by a low-powered laser, and has a label side and a data side. Rather than storing music, the CD-ROM is used to store information, holding approximately 550 megabytes (MB) of data (equivalent to 1,500 floppy disks of information or 200,000 pages of printed text). Because the disc has to be mastered, the data stored in CD-ROMs cannot be altered, hence the term READ ONLY. Very simply, the CD-ROM is a type of storage media, similar to a hard disk but of greater capacity.

Manufacturing CD-ROMs

CD-ROM technology involves two phases: the manufacturing phase and the playback phase. For the most part, users are concerned with the playback phase, although the manufacturing phase is more critical to CD-ROM technology. This phase consists of preparing the data and stamping them onto a master disc. Preparing the data is the most intensive step. Coming from such diverse sources as databases,

printed documents, photographs or drawings, the information is labouriously gathered and converted to a machine-readable format. The digitized data is then formatted and transferred onto magnetic tape. After converting, encoding, and verifying the information carefully, the data is finally ready to be recorded on a master disc.

To master a disc, a glass disc is first polished and spincoated to a precise thickness with a photoresist material. Bit by bit, the information on the magnetic tape is etched onto the photoresist by a laser beam. The recording process is done radially, that is, from the centre of the glass disc outward, which results in a series of pits in a spiral pattern. Completion of the recording process results in a positive master copy. A set of negative masters are also created and used to mold the information-bearing pits onto plastic discs. Mastering a disc a few years back would cost from \$10,000 to \$30,000. Now, a disc can be mastered in five days for about \$1,500. Replication is approximately \$2 per disc. (The purchase price of a CD-ROM takes into account the extensive costs involved in the data collection, formatting, and verification early in the process.)

Playback: Using the CD-ROM

The playback phase consists of deciphering the data encoded on the

disc using a CD controller and then presenting the information to the host computer. For most people, the playback phase simply means booting the computer system, turning on their CD-ROM player, and inserting a disc.

Originally, manufacturers had their own formats for mastering their discs. Consequently, the different discs could not be accessed by all computers: each disc and each machine required a separate piece of software. Fortunately, at a conference held at the High Sierra Resort in Reno, Nevada, manufacturers decided that a common mastering format should be established. As a result, the "High Sierra" format was born and all discs of this format can now be played on any machine.

CD-ROM Hardware

CD-ROMs can be accessed by just about any type of computer: PC/XT, AT, or clone; PS/2, Apple, or even laptop. Essentially, all you need is a CD-ROM player, the proper interface, and the disc itself to access the information.

CD-ROM players are manufactured by Amdek, Apple, Denon, Hitachi, NEC, Panasonic, Philips, Sony, and Toshiba. As CD-ROM technology evolves, the design of these players becomes smaller, lighter, and more efficient. There are even portable players in the market today. The interesting twist about these players is that they can all play CDs when they're not being used as CD-ROM drives. CD players, however, cannot be used to read CD-ROMs.

Why CD-ROMs?

The appeal of CD-ROMs lies principally in their massive storage capacity. Anyone who needs access to a large amount of information will

find searching with a CD-ROM much easier and more convenient. Libraries, educational institutions, businesses, and information services will find CD-ROMs particularly useful.

In addition, CD-ROMs can serve as multi-purpose teaching aids. As an example, *Ecodisc* is a new CD-ROM being developed by Apple and the British Broadcasting Company (BBC) for educational purposes. *Ecodisc* is a true example of a multimedia CD-ROM, a disc that integrates photographs, video, sound, text, graphics, and data. Designed for students in such fields as the sciences (e.g., microbiology) and environmental sciences, *Ecodisc* contains a wealth of information on the ecosystem of a nature reserve. An added bonus is that *Ecodisc* has been mastered in nine languages: English, French, Spanish, German, Norwegian, Swedish, Danish, Italian, and Dutch. Thus *Ecodisc* can even be used as a language teaching tool.

All CD-ROMs can be used as a source of reference or as a source of hardcopy materials. Used as a teaching supplement, learning becomes more flexible and convenient for both the instructor and the student.

What's out there?

In the market today, you will find a vast array of CD-ROMs, such as the *Building Code*, *Physician's Desk Reference*, *Readers' Guide to Periodical Literature*, and Grolier's *Academic American Encyclopedia*.

Other reference CD-ROMs you may find include the *Encyclopedia of Science and Technology* by McGraw-Hill, *CCINFO* by the Canadian Centre for Occupational Health and Safety, and *Books in Print* by Bowker.

More recent titles include *Merriam Webster Ninth New Collegiate Dictionary* by Highlighted Data. This CD-ROM is the complete text and

graphics of the print version of the Merriam Webster dictionary, accompanied by recorded pronunciations of all the words. There is also the *Electronic French Dictionary* by ZyZony, which has as many as 70,000 common and proper nouns.

Also, you may find the *News Digest* by Facts on File to be of interest. *News Digest* covers U.S. and international events with the full text and maps of the news items appearing in the 1980 to 1987 issues of *News Digest*.

In the sciences, you will find *Aquatic Science and Fisheries Abstracts*, *CD-Gene*, *Cancer Literature*, *Encyclopedia of Polymer Sciences and Engineering*, *Kirk-Othmer Encyclopedia of Chemical Technology*, *Life Sciences Collection*, and *Science Helper K-8*. For geography, there are the *Geodisc U.S. Atlas*, *Meteorological Data*, *Country Statistics*, and *Supermap*. With up to 500 CD-ROMs to choose from, there are enough CD-ROMs to appeal to almost everyone.

Problems with CD-ROMs

Without a doubt, CD-ROM technology is expensive. Although this may change with time, many people find today's pricing exorbitant; hence, the slow proliferation of CD-ROM technology. When consumer demand increases, prompting supply to increase as well, the pricing may drop significantly.

Disregarding expense for the moment, a noticeable disability of the CD-ROM is the slow seek time involved. In comparison to the floppy diskette, the CD-ROM processing time is longer. Also, because some searches are conducted by keyword, some people may find the CD-ROM an inflexible method of searching.

However, keep in mind that the CD was originally designed to play

music and not data. Because the data is encoded in a spiral pattern and because of the massive amount of data in question, the information that you seek is mechanically difficult to find. Essentially, the CD-ROM reader conducts the search via the process of elimination. By starting at one small area of the disc, the head moves back and forth until it finds the precise location of the information. Since the data is located at a miniscule area on the disc, the search can be lengthy, depending on the information sought as well as the disc itself.

CD-ROMs in the Future

Some people argue that other forms of data storage are being developed that will one day equal or surpass the storage capacity of the CD-ROM. Right now, only one side of the CD-ROM is used for data storage. If both sides were used, one disc would provide approximately 1,000 megabytes of storage. Not only is this a phenomenal amount of storage but it also

surpasses other technological developments of the present and the near future.

Even now, there are plans to install internal CD-ROM drives into computers as original equipment, eliminating the need for external players and interfaces. As more people choose to invest in CD-ROM technology, more CD-ROMs will be introduced into the market, and the technology will be less expensive. CD-ROM technology will then be truly accessible.

CD-ROMs at UTCS

Here at University of Toronto Computing Services (UTCS), we have CD-ROMs for staff as well as public use. The facilities in our Micro Lab are available for members of the University of Toronto (which include faculty, staff, and graduate students) to use on their own.

In the Micro Lab at UTCS, a Hitachi CD-ROM player is hooked up to an IBM PC/XT machine. The CD-ROMs available are *Computer Library*, *PC-SIG Library*, and *Bookshelf*.

Computer Library is a collection of approximately 105 international abstracts and 60,000 computer articles in full text. Citing from as many as 32 different sources, like *PC Magazine* and *MacWeek*, *Computer Library* is distributed by Ziff-Davis 12 times a year. Each disc is a 12-month compilation of the preceding year, so each disc is actually an information update.

PC-SIG Library is a collection of public-domain and shareware programs. *Typing Tutor* is but one of the many programs stored in the disc. Listed in an index, the programs are all archived and compressed. Anyone who wishes to use one of the available programs must first copy and then de-compress the program.

Bookshelf, by Microsoft, is like a reference library in CD-ROM form. *Bookshelf* contains a dictionary, a spelling checker, the *1987 World Almanac*, and *Bartlett's Familiar Quotations*. The dictionary is the American Heritage version and the Spelling Verifier and Correction is from Houghton Mifflin. The disc also contains *Roget's II: Electronic Thesaurus*. Since it contains business information sources and the U.S. ZIP code directory, *Bookshelf* can be used as a multi-purpose reference tool.

CD-ROMs available at U of T

Besides UTCS, there are CD-ROM facilities available on other sites at the University of Toronto. They are available for the U of T community at the following libraries: Centre for Computing in Humanities, Education, Library Science, Ontario Institute for Studies in Education (OISE), Robarts, Science and Medicine, and Sigmund Samuel. The Engineering library is currently

working toward CD-ROM facilities for the future, specifically the database *Compendex*. Most of these facilities need to be reserved before use and can be used for a limited amount of time only. If anyone is interested in the CD-ROMs available or in reserving workstations, contact the respective library for more information.

Library	Number of Workstations	CD-ROMs Available
Centre for Computing in Humanities	2	<i>Oxford English Dictionary</i> , <i>IBICUS</i> (a database of Greek literature)
Education	1	<i>Educational Resources and Information Centre (ERIC)</i> , <i>Onteris</i> , <i>Education Index</i>
Library Science	2	<i>Books in Print Plus</i> , <i>CDMARC Subjects</i> , <i>Dialog/ERIC</i> , <i>Dissertation Abstracts</i> (1982-5), <i>EBSCO</i> (serials), <i>Globe & Mail</i> (1985), <i>LISA</i> , <i>Library Literature</i> , <i>UTLAS/CD-CATSS</i> , <i>U of Guelph Catalogue</i> , <i>ULRICH's</i>
OISE	1 being set up	<i>ERIC</i>
Robarts	1	<i>Canadian Business and Current Affairs (CBCA)</i> , <i>PsychLit</i> , <i>Sociofile</i>
Science and Medicine	2	<i>Excerpta Medica</i> (1988 edition), <i>Med-Line</i> (with citations from the previous five years), <i>Science Citation Index</i> (1986/8)
Sigmund Samuel	2	<i>Biological and Agricultural Index</i> , <i>General Science Index</i> , <i>Humanities Index</i> , <i>Social Sciences Index</i> , <i>Wilson Line Index</i>
Scarborough College	4	<i>Applied Science and Technology Index</i> , <i>Biological and Agricultural Index</i> , <i>Business Index</i> , <i>CBCA</i> , <i>Essay and General Literature Index</i> , <i>General Science Index</i> , <i>Humanities Index</i> , <i>Life Sciences</i> , <i>MLA International Bibliography</i> , <i>Public Affairs Information Service (PAIS)</i> , <i>PsychLit</i> , <i>Social Sciences Index</i> , <i>Sociofile</i>
Erindale College	5	Their collection consists of all the titles that the Scarborough Campus carries except for the <i>Essay and General Literature Index</i> and <i>PAIS</i> . In addition, they have <i>Books in Print Plus</i> (Canadian and British versions), the <i>Canadian Census</i> , <i>PC-SIG</i> , <i>Population Statistics</i> , <i>Shareware Grab-bag</i> , and <i>ULRICH's</i> .

Personal Bibliographic Software

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If, like many students and teachers, you find creating properly formatted bibliographies a chore, perhaps you should consider using bibliographic software. Personal bibliographic management systems are a maturing software genre and, in this and related articles to follow, we would like to introduce you to such software and review some of the popular packages.

A personal bibliographic management system (PBMS) is software designed exclusively for keeping track of references and for producing properly formatted bibliographies that can be appended to the end of papers. Such software should allow you to do the following:

- enter references easily,
- sort and search a large database of references,
- choose among a number of different formatting styles (MLA, Chicago, or one of your own),
- export a properly formatted bibliography to your word-processing software so that it can be easily included in any document you are preparing.

A PBMS is not to be confused with software used for maintaining library collections; a personal system is designed primarily to help you create bibliographies with the information formatted according to the desired style. A PBMS generally does not allow you to keep track of circulation information such as whether someone has signed out a book.

Typically, you would use a PBMS in two ways: for entering a list of references and for producing formatted bibliographies. The entering of references usually takes place while doing the research for a project. While reading for a project, you would enter for later use all the references you find interesting. These references then would be added to a growing database or a list of references gathered from earlier projects. One advantage of using software to maintain bibliographic information is that such software will save time by eliminating the retyping of references used more than once.

Once you have entered all the interesting references,

you will want to use the PBMS to generate bibliographies. Whenever you need a bibliography, whether it be for a student who needs references for a project or for a paper you plan to submit for review, you can use the PBMS. Depending on the need, you might generate a bibliography and print it within the PBMS,

Kristeller, 1964 #19	
Reference Type	Book
<u>Author</u>	Kristeller, Paul Oscar
<u>Year</u>	1964
<u>Title</u>	Eight Philosophers of the Italian Renaissance
<u>Series Editor</u>	
<u>Series Title</u>	
<u>City</u>	Stanford, California
<u>Publisher</u>	Stanford University

Example of an entry form

or export it so that it can be inserted into a word-processing document.

One of the strengths of a PBMS is its ability to generate different bibliographies, for different purposes, from the same data. With a PBMS, you can search for and select subsets of your larger list for particular purposes. For example, you may wish to check what you have read, but forgotten, by a particular author. You may wish to give a student only the references that were written in the last ten years or you may want to produce a bibliography on a particular subject from a collection spanning all your interests. A well-designed PBMS will allow you to browse easily through your collection and select a short list of references on demand.

A PBMS also allows you to format the same selected list of references in more than one way. If you are submitting a paper to several journals with different style requirements (e.g., one journal requires MLA style and another requires

Chicago style), you can produce bibliographies formatted specifically for each journal. Once you have selected a short list of references, you would choose a formatting style sheet and generate a bibliography in that style. The style sheet controls the appearance of the references when they are printed or exported. Most PBMS programs give you a list of predefined style sheets to choose from, along with tools for editing the styles to suit your needs. They will also let you create personalized styles. Choosing the style sheet is, in effect, choosing the way you want the information organized before it is exported. With the style sheet, you control the order of the information (e.g., author, title, date), the text characteristics of fields (e.g., italicized or underlined titles), and punctuation of the bibliography.

What should you look for in a PBMS? Here is a list of some of the things we looked at when we reviewed PBMS software:

1) Entry of references. Is the PBMS easy to use when entering references? A good PBMS will make it clear where to enter information and how to enter it (e.g., do you put the author's last name first or last?). A good program will have entry forms for the different types of work you need to reference or for the tools with which you create your own entry forms. It is in the number and complexity of the entry forms that the complex PBMS programs differ from the easier ones. A good PBMS should also make the tedious entry of references as painless as possible by providing shortcuts and good editing tools.

2) Searching tools. Does the PBMS allow you to easily find references once you have a large collection? All PBMS software will have searching tools, although some will be simple and others will allow complex Boolean searches where you can ask, for example, to see all the references by a particular author written between a certain period about a certain subject. It is also important to consider the display of the search results. Is the program

easy to use when navigating large collections of references? Does it allow you to get the information you want quickly and easily?

3) Style sheets. Central to the use of a PBMS is the formatting of the information for exporting. The formatting is handled through style sheets. They tell the program how to arrange the information and punctuate it. A good program should have:

- an adequate collection of predefined styles,
- styles that can handle common problems such as an empty field or multiple authors,
- tools to edit the existing styles,
- the ability to create new styles.

When looking at a PBMS, you want to first check that it has style sheets for the types of bibliographies you want to produce. Then you want to see how they handle the type of work you typically reference. Do you frequently refer to video materials? Does the system you are looking at know how to handle such materials in the Chicago style? You will also want to find out how easy it is to alter styles and create new ones. Some PBMS force you to learn a programming language to alter the styles, while others have easy-to-use style editing environments.

4) Exporting. More importantly, does the PBMS work with the other software you use for academic projects, especially your word processor? It doesn't matter how nice the formatting is if you cannot export a file into your word processor with the formatting intact. If you want your titles italicized, you will want the correct codes placed in the exported file for the word processor you use. Thus, it is important to find out what software your PBMS works with. Some programs will even scan a word-processing file for all the citations, build a bibliography from what you cited, and append that bibliography to the file.

5) Importing. Another consideration is the importation of information from other bibliographic systems. If

you use online bibliographic databases like Dialog, you may want to save yourself the time of retyping all the information garnered from the online service. There are specialized companion products for some of the PBMS that will convert the information gathered online to information that can be imported directly into

Kristeller, Paul Oscar. Eight Philosophers of the Italian Renaissance. Stanford, California: Stanford University, 1964.

Lancashire, Ian. "Using a Textbase for English-language Research." Third Annual Conference of the UW Centre for the New Oxford English Dictionary: The Uses of Large Text Databases. Waterloo, Canada: 1987.

Marsh, David. The Quattrocento Dialogue. Cambridge, Massachusetts: Harvard University Press, 1980.

Example of a short bibliography

your PBMS.

6) Support and Cost. What will it cost you to use a PBMS in terms of the initial price of the product and the time needed to learn to use it appropriately? Before purchasing a complex PBMS, consider the cost of learning as well as who you can call on for support. (All the programs reviewed in *ComputerNews* are supported by UTCS to a limited degree. See the following review articles for more information.) There is also considerable difference in the dollar costs of PBMS. The more complex programs frequently cost more but they also offer more features.

To conclude, no PBMS will handle every possible type of work and reference. The more complex the PBMS, the more situations it can handle and the more complex it will be to use. Complex programs take an understanding of bibliographic issues that many of us do not have, as they are designed for professional librarians. They force you to think about bibliographic issues not critical to producing a simple paper. A complex program can handle obscure situations, but you need to

know how to handle the program. Imagine choosing between five different entry forms for a book and deciding who the primary, secondary, and series authors are. Take the time to decide what level of complexity you are willing to put up with.

Above all, you need to find software that is compatible with your research habits, with other computer programs and, especially, with your word processor. The main use of a PBMS is to automate the process of creating bibliographies at the end of papers. If the PBMS does not work with the word processor you use for writing the paper, you will have to type the bibliography again or edit what is converted from your PBMS. A PBMS is a companion product to your word processor that should make the chore of creating bibliographies less tedious, not more.

In the articles which follow, we will review a representative set of PBMS programs for the Macintosh. (Reviews of PBMS for the MS-DOS environment will follow in the May/June issue of *ComputerNews*.) The decision to review was based partly on what is currently used here at U of T, partly on the need to describe a range of products from the simple to the complex, and partly on which vendors were willing to provide review copies of their software. We would like to thank Personal Bibliographic Software for demonstration copies and manuals of *Pro-Cite* for the Macintosh and PC; Pro/Tem Software for a review copy of *Notebook II*; Oberon Resources for a review copy of *nb Citation*; and Harry Hahne for a demonstration copy of *Library Master*.

Macintosh Bibliographic Software

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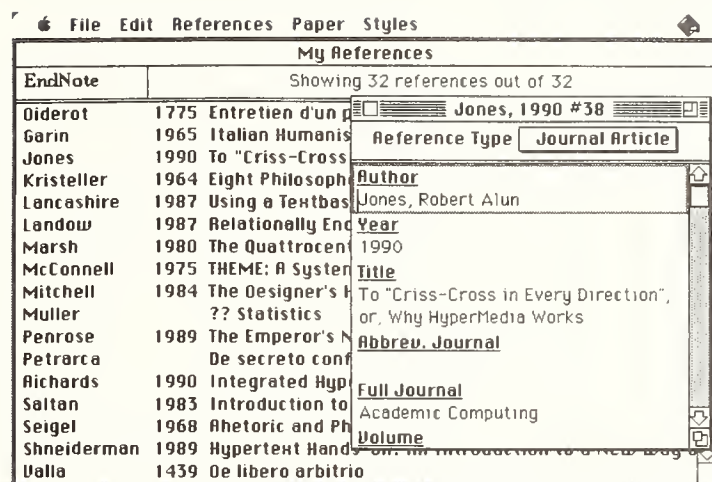
On the Macintosh, there are only two commercial Personal Bibliographic Management Systems: **EndNote** and **Pro-Cite**. The two systems are intended for different users: EndNote is designed to be easy to use and works closely with word processors like Microsoft Word; Pro-Cite is a complex and expensive program that offers a more complete set of features.

EndNote

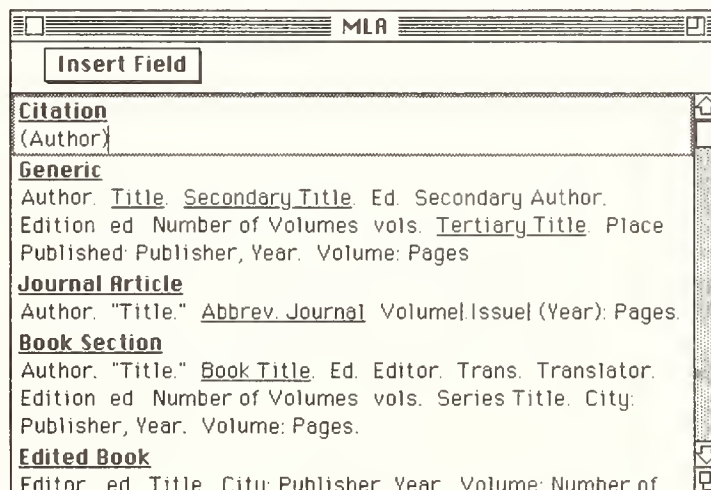
EndNote is one of the most attractive PBMS programs I have seen. It was designed to give the academic a useful and easy bibliographic system that works closely with a word-processing package. It is not intended for librarians, as it is designed primarily with academic papers in mind.

EndNote comes in two forms: a desk accessory that can be called

while using your word processor, and a stand-alone program that can read word-processing documents and add formatted bibliographies to them. When you first open an EndNote file in either version, you get a list of all the references in that file, shown with the last name of the first author, the date, and part of the title. To see and edit a reference, you double click on the relevant line,



EndNote basic screen



EndNote Style Sheet

opening a reference window where you can enter information.

The main list is where you manipulate references. You can browse your references, opening and closing those that interest you. There are tools for searching this list and showing only the references that match your interests. You can cut and paste complete references from one bibliography file to another using their lists. You can select references to be copied (fully-formatted or as citation codes) to a word-processing document.

If the list is the way to handle references as a whole, the entry form is where you enter and edit the individual references. You can have more than one entry form open at a time. Each form is a resizable window where you type information about a reference.

Why use the desk accessory version of EndNote? Because, it allows you to enter and check references while in your word processor. You can copy a formatted version of the reference to your word-processing document (this would be one way of generating a bibliography) or you can copy a citation code that will later be used to generate the complete bibliography. The citation code is a marker that the stand-alone EndNote uses when scanning the document. The idea is that you write the paper, placing citations every time you reference a work, and then have EndNote scan the document to generate a bibliography of the works cited. The bibliography is appended to the document by EndNote; the next time you open the document, it is complete, with a final bibliography.

When EndNote scans the document, it replaces the citation code with a citation formatted according to the formatting style chosen. EndNote's ability to work closely with a word processor makes it stand out from other PBMS software.

Manipulating the style sheets that control the formatting of bibliographic records is the most difficult part of using any PBMS program. EndNote has done a superb job of making the style sheets easy to use, without sacrificing features. Each style sheet is a "style" of formatting for all the types of references allowed by EndNote. For example, the MLA style sheet tells EndNote how to format all the entry types according to the MLA style guidelines. Books are done one way, journal articles another.

You can have unlimited styles, as

each style is a special EndNote document kept in a folder called "Styles." The style sheets have fields for each type of reference. One can have a maximum of 15 types of entry form (e.g., book, journal article, computer program). In these fields, you lay out the information from the entry form with the separating punctuation you want for the particular style. The MLA style sheet included with EndNote lays out a formatted book reference differently from the Chicago style. You can control the way a piece of missing information is handled, the way the style handles multiple authors, and the way the style sorts the references.

EndNote's drawbacks are partly

due to its simplicity and its intimate relationship with Microsoft Word 4.0. Its searching tools are not as powerful as I would like. (Pro-Cite, by contrast, has a complete searching environment that allows one to isolate precisely the references one wants.) EndNote has no print feature of its own. If you have a list of references you want to print to give to someone, the best way is to copy the formatted version to the clipboard and paste it into your word processor. In the word processor you can then edit and print them. This, to an extent, makes sense, as EndNote is meant to work with a word processor and hence depends on it for printing. Finally, because EndNote is designed to work closely

with word processors by scanning their documents, it necessarily works with only certain word processors in certain ways. In its current release, it works with Microsoft Word (Versions 3 and 4), WriteNow, WordPerfect, and MacWrite. It is not guaranteed to work with each new version of these word processors and, most frustrating of all, the citation codes from which it generates a final bibliography cannot be placed in the footnotes of Word documents. This means that those of us who like to have our citations in footnotes, have to leave the citations in the text, at least until the final bibliography is generated.

Pro-Cite

Pro-Cite is a complex, feature-laden, and expensive alternative to EndNote. It is for the professional bibliographer who uses a PBMS every day and needs the advanced features. Its interface, on the surface, is simple. When you open a library, you get a single entry form. Much like HyperCard stacks, you click on buttons to go to the next or previous reference. Most of the other features are implemented through dialogue boxes, with the exception of a resizable text window in which you can see and edit bibliographies generated by Pro-Cite. The main advantage to Pro-Cite over EndNote is its advanced features, described below.

Authority Lists

One of the problems you may encounter when entering large numbers of references is that the same author might be entered in two different ways. You might, for example, enter "Petrarch" one day and the Italian version of the name on another occasion. Authority lists allow you to keep a list from which

you can pick names already entered. It is useful for keywords, where you want to avoid more than one keyword for the same subject. An authority list gives you control of the terminology used in collections of references.

Indexes

Pro-Cite allows you to generate indexed bibliographies where all the references are organized under their

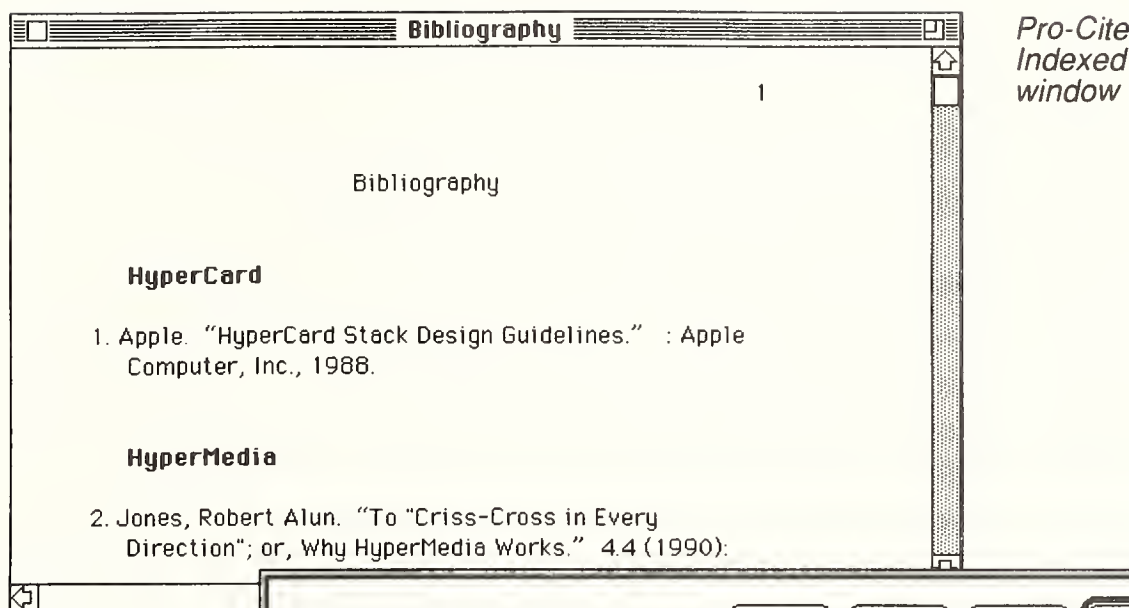
respective index terms. The bibliography will have the index terms in alphabetical order, with the relevant references under each heading. If you need this feature, Pro-Cite will save you a lot of work.

Searching Tools

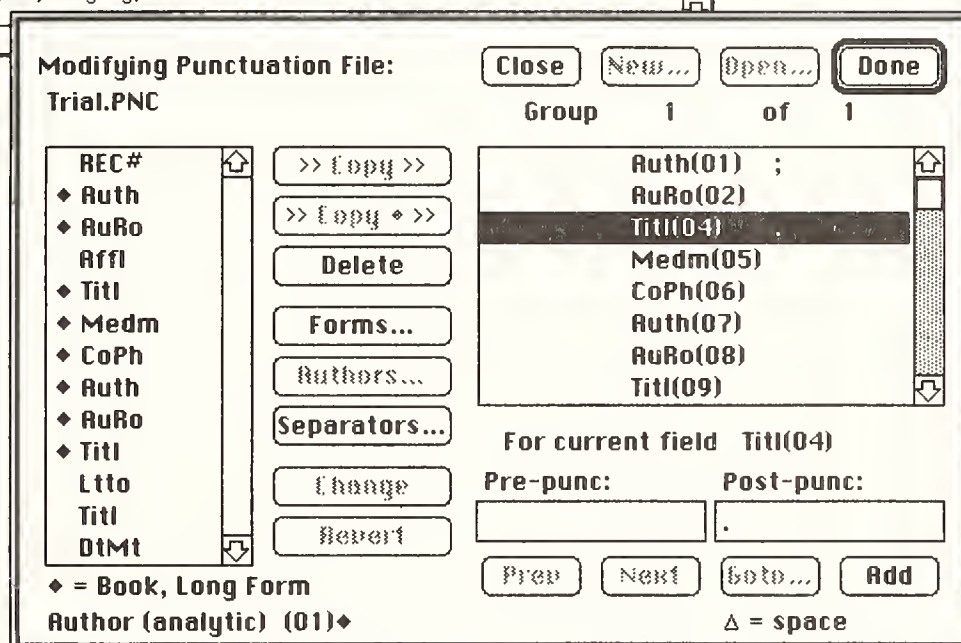
Pro-Cite has a complete, though unintuitive, set of searching tools that allow you to create a complex query, such as: "Find all the works

The screenshot shows a window titled "Trial" with a form for entering bibliographic data. The form is divided into sections: "Auth" (Author) with the name "Shneiderman, Ben//Kearsley, Greg", "Title" with "Hypertext Hands-On! An Introduction to a New Way of Organizing and Accessing Information", "Medm" (Medium), "CoPh" (Call Number) with "44", and "Publ" (Publisher) with "Addison-Wesley". There are also fields for "Auth", "AuRo", "Title", "Edit", "Auth", "AuRo", "PIPu", and "Publ". At the bottom, there is a "Record Number" field with the value "300" and a "Selected" checkbox that is checked. Navigation buttons at the top include "Update", "Cancel", "PrevSel", "Prev", "Next", and "NextSel".

Pro-Cite basic editing window



*Pro-Cite
Indexed
window*



*Pro-Cite style
edit screen*

written between 1970 and 1980, that are about Petrarch, but not about philosophy." Once you have an enormous library of references, advanced searching tools are helpful for managing and finding works. Generally, the larger the collection, the more precisely you have to search it. Pro-Cite has the tools for searching an enormous collection.

MS-DOS Equivalent

Pro-Cite also exists in much the same form for the IBM PC. This is

an advantage for people who are working on bibliographic projects on both platforms. Personal Bibliographic Software, the maker of Pro-Cite, has been in the PBMS business for some time, so there is a good chance that your work will be portable to other systems in the future. PBS is a reputable company that has been around for a while.

Direct Printing

Pro-Cite, unlike EndNote, prints bibliographies directly. Whenever a

bibliography or index is generated, it appears in a primitive word processor so you can edit the output before saving it or printing it. This is, however, a mixed blessing, since Pro-Cite does not work as well with other programs like word processors. Pro-Cite is intended primarily for professional bibliographers who generate bibliographies within Pro-Cite, edit them within the package, and print them for their clients, still within Pro-Cite. It is not as convenient for academics who generate bibliographies for inclusion in other documents written elsewhere. Pro-

Cite will not scan a formatted document for citations (it can only scan text files), nor will it allow you to copy formatted references easily to your documents. You can always cut and paste the results, or open them within the word processor, but the bibliographies that Pro-Cite formats have unnecessary spaces and returns that have to be edited. (See Pro-Cite Style Edit screen on previous page.)

The major drawback to Pro-Cite is its interface. For those Mac users who bought a Mac to avoid PC-like programs, Pro-Cite will be a nightmare. It closely resembles its PC sibling, which is an advantage for those who have to work in both environments and want both programs to look the same, but this is a disadvantage for those who want a well-designed Mac interface. Pro-Cite does not have a master list from which to browse references, and you cannot look at more than one full reference at a time (there is a peculiar feature that shows three short forms at a time, but not any three). The style sheet editing environment is best avoided, and strangely does not allow you to set the text attributes of the fields. Italicized titles are, for example, controlled elsewhere, independent of the style sheet. The developers

chose to make their Mac program resemble the PC one, which is understandable but does not mean that the Mac version is either easy to learn or attractive.

To conclude, EndNote is one of the best PBMS programs available for the academic with a modest budget and a Macintosh microcomputer. It can be bought for around CDN\$100 by mail order. It works well with popular Mac word processors, is easy to use, and has most of the features the academic would want for a personal reference library. Pro-Cite has a more complete set of features, including some that are of particular interest to professional bibliographers. It is also an unnecessarily complex program that does not work smoothly with word processors and is more expensive (around CDN\$250, when discounted). If you do not need the advanced features and are not planning to work with PCs, I would recommend EndNote.

UTCS has a copy of EndNote which we can demonstrate and which we support. We have demonstration copies of Pro-Cite that we can lend you, and we also have the manual which allows us to support Pro-Cite users to a certain extent. Contact Geoffrey Rockwell at 978-4548 for further information, opinions, or support.

EndNote
Niles & Associates, Inc.
2000 Hearst St.
Berkeley, CA 94709
USA
(415) 655 6666

Pro-Cite
Personal Bibliographic Software,
Inc.
P.O. Box 4250
Ann Arbor, MI 48106
USA
(313) 996-1580

The Internet: Evolving Toward a Globally-Connected Computing System

Glenn Britton
britton@utcs.utoronto.ca

Internet is a group of hundreds of TCP/IP networks connecting thousands of computers at universities, research institutions, and government agencies across North America. (TCP/IP is a set of protocols governing communication between computers on the Internet.) Internet is composed of subnetworks: local area networks (LANs) are connected to regional networks which, in turn, are connected to national and international networks. Local TCP/IP networks might connect machines within a department or might be part of a campus-wide network. Regional networks might connect TCP/IP networks at universities within a province, as in the case of the Ontario Network (ONet). ONet is connected to the American TCP/IP research networks, including the NSFnet, a network connecting American National Science Foundation supercomputers through a link from the University of Toronto to the Cornell National Supercomputer Facility.

You Don't Have to Know Where the Wires Go

The Internet appears to a computer user as the telephone network appears to a person making a telephone call. You don't need to

know where the telephone wires are in Quebec to place a call to Montreal. Similarly, when trying to connect to a computer on the Internet you do not need to be concerned with the location of the network's wires in order to use Internet services. The structure of the Internet, for the most part, is invisible. The Internet appears as one large integrated network. You need to know only the address of a computer on the Internet to be able to connect to it, just as you only need a phone number to call a friend in Montreal.

File Transfer Protocol (FTP) is one of many services provided on the Internet. (Other services include electronic mail, remote login, and so on.) FTP allows you to use any computer to send files to or receive files from any other computer, at high speeds. FTP will operate on virtually every type of computer architecture — personal computers, mainframes, and others. The FTP protocol can be used to transfer files across an office or across a continent, providing a network connection exists.

To use FTP on your computer, you need a connection to the U of T campus TCP/IP network, as well as a special FTP program. The program looks different depending on the type of computer you are using. On a Macintosh, it will look

A Sample FTP Session

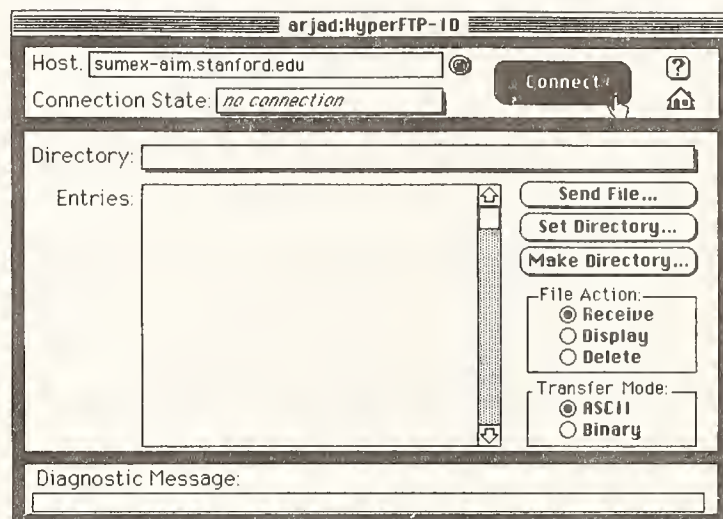


Figure 1: Connecting

The figures on this page illustrate a Macintosh FTP session using the HyperCard Stack "HyperFTP" where the user is trying to connect anonymously to a file server at Stanford University. This particular file server has a huge number of files for Macintosh computers: utilities, fonts, HyperCard stacks, programming tools, communication tools, artwork, and so on. When HyperFTP is started, the

name of the remote system is chosen from a list of commonly-used hosts or, alternatively, the address is typed manually in the Host box (see Figure 1). Figure 2 shows that the connection to the remote computer has been established and lists file and folder entries available to be explored. By clicking on files, the file hierarchy of the remote host can be explored. During the session, you can

explore as many folders and files as you like. When you find an interesting file you click on it to have a copy sent to your machine. Figure 3 shows a file named "aclock2.hqx" found on the remote server after a few minutes of exploring. This 4000 byte file is a clock accessory and was copied to the Macintosh in only a few seconds.

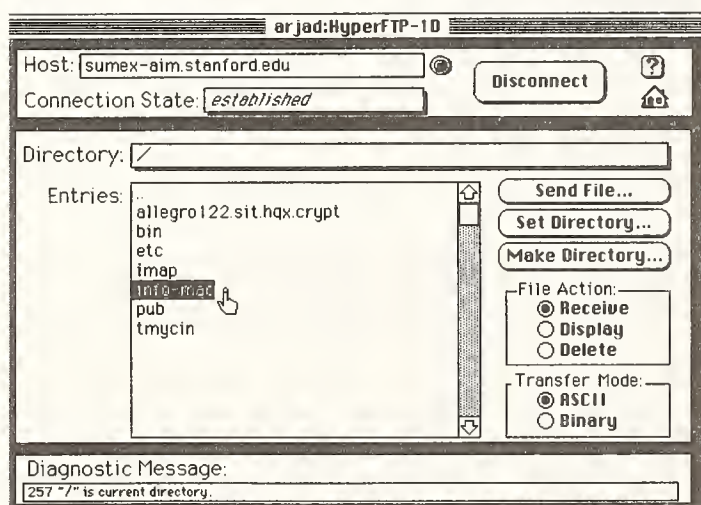


Figure 2: Selecting Directory

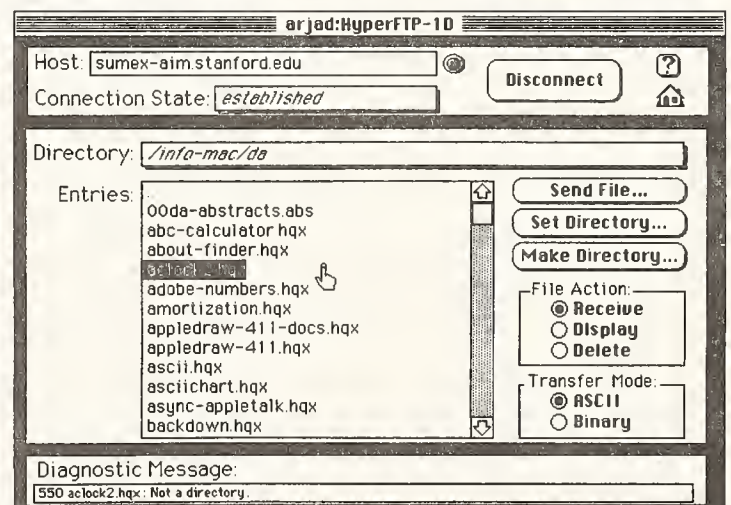


Figure 3: Choosing a File

like a typical Macintosh application; FTP running on a UNIX machine will "look" like a UNIX application. The same is true for other operating systems.

Although FTP is a general-purpose file transfer utility, it is not always the best tool for the job since there are instances where a simpler method of performing the task may exist. For example, in the UNIX operating system there is a command, "rcp", that performs remote copying of files between UNIX machines. It is quicker to use "rcp" to perform file transfer. Generally, when moving files between two like computers (e.g., from Macintosh to Macintosh) there may be ways to copy files that are simpler than FTP. But, for long distances or for file transfer between any two different types of computers, FTP is frequently the right choice.

Anonymous Access

When using FTP services on the

Internet, you are connecting to a remote computing system. This system can be used in two modes: you may use an account on the remote system or you may use the remote machine anonymously. If you have an account, you may use all the facilities to which that account is privileged. When using FTP anonymously, providing that the remote machine supports this, you log in with a user name of "anonymous" to the remote FTP service. When you connect anonymously, there may be restrictions as to which files you can copy, delete or alter.

When using anonymous FTP, there are tremendous numbers of public domain files you can access. Some of these files are programs for PCs and Macintoshes, while others are programs for mainframes and supercomputers. Others are documents, graphics — all kinds of stored information can be found. During a recent FTP session, I found a file which listed approximately 700 FTP sites in North America supporting anonymous login.

Communicate Faster; Share Information Efficiently

There are many benefits for researchers using FTP on the Internet. The ability of colleagues to communicate faster and share information more efficiently is evolving with the technology of the Internet. But more than raw performance of the Internet is improved. The perception of what a computing system is and what work people can perform on computers is changing as the Internet evolves toward a globally-connected computing system. Magazines, journals, and computer applications can be developed by colleagues throughout the world in new and innovative ways with the enhanced communication provided by the Internet.

For more information call Glenn Britton at 978-6346.

ProComm Communications Program Seminar

**April 11, 1990
1:00 - 3:00 p.m.**

ProComm is a general purpose communications program currently available to all U of T faculty, staff, and students. It is suitable for connecting to the many networks on campus.

A seminar has been scheduled to introduce ProComm and its various features: terminal emulation (a number of popular ones will be reviewed); the dialing directory; file transfer protocols, such as Kermit and XMODEM; configuration and modem parameter settings; and the DOS gateway, which allows you to execute DOS commands and other programs while you are still in ProComm.

There is a fee for this seminar. Copies of ProComm are made available at no charge to members of the University, but you must bring your own diskettes (two 5.25" or one 3.5").

To reserve a place in this seminar, please contact Irene Rosiecki at 978-4565.

Free NetNorth (Electronic Mail) Demonstration

**April 11, 1990
3:00 - 5:00 p.m.**

Anyone interested in sending documents to colleagues or friends reliably, quickly, and inexpensively will not want to miss this demonstration. We will introduce you to the NetNorth/BITNET/EARN communications network, which is accessible from the CMS system. This network connects more than a thousand universities and research institutes in Europe, Asia, and North America. Sending documents or files over the network is very easy to learn.

We will show you how to send mail and files to another institution, and how to talk directly to someone on the network. **Please note this is a demonstration only.**

Space is limited. If you would like to attend one of these sessions, please contact Irene Rosiecki at 978-4565 to reserve a place.

A Big Year for SAS

Barry Lay
barry@vm.utcs.utoronto.ca

In the next few weeks, UTCS expects to receive Version 6.06 of SAS for VM and MVS. This new release incorporates major improvements and a complete restructuring of Version 5. Those who have seen SAS on the PC or on UNIX will recognize some of the enhancements, but there are still a number of changes from Version 6.03.

The main change from the SAS Institute's point of view is that all of the Version 6 SAS products were written from scratch in the C language, breaking from the tradition of a mix of FORTRAN, PL/I, and Assembler. This allows the new releases to be more easily transferred between different hardware platforms and operating systems, while keeping the same essential flavour. Those using VAX and Data General SAS products will appreciate this change. The conversion also allows the interface between procedures, files, and the screen to be repackaged for future enhancements.

The biggest change for the mainframe user will appear in the dialog manager. This component of SAS existed in Version 5 but was very limited. The new version allows for multiple windows placed anywhere on the screen; with drop-down menus, pop-up alerts, scroll bars, and mouse control where allowed by hardware. Graphics in windows may

be cut and pasted, and there is a complete screen control language to allow the application programmer to custom design the presentation for end users.

Mainframe, PC, and UNIX users of SAS will appreciate a completely redesigned communications package called SAS/Connect. This product will allow transfer of SAS programs, datasets, and graphics across networks of various varieties, including TCP/IP. Coupled with this is an announced plan to allow SAS datasets to be split across different machines, with central data being merged with local data into a single dataset, automatically while it is being accessed, without the application having to be rewritten to take advantage of this facility.

The extra flexibilities of the SAS dataset stem from a new layered approach to data in SAS. The standard SAS library is associated with an external dataset or set of files and a "method of access" via the LIBNAME statement. This method of access is new with Version 6 and allows many opportunities for dataset organization. Besides the aforementioned split datasets accessed across a network, SAS will now allow a dataset to be stored on the local machine in any form the user desires. It may be more convenient or efficient to store a dataset in a database table or flat

file rather than in SAS' proprietary form. This effectively eliminates the requirement for such procedures as DBF, as SAS can store data directly into dBase II, III, or IV format from the DATA step. The SAS Institute has already indicated that it will support most of the popular database packages in this way, as well as supporting their own formats from previous versions. SAS is also publishing the interface so that other vendors may put SAS support into their own products.

In order to improve performance with SAS native datasets, an index may be specified based on one or more variables. In addition, the WHERE statement borrowed from SQL may be used to subset data used in procedures, eliminating the need for the trivial DATA step normally employed for this purpose. This reduces the amount of I/O and disk space used.

The SAS procedure step has also received attention. Many of the existing procedures have been reorganized to standardize their syntax, and common facilities have been grouped together. For example, procedures MEANS, UNIVARIATE, and SUMMARY now have the same statements and, in fact, are the same procedure "under the cover." PROC PRINT has been enhanced with many new features, and there is a new PROC REPORT for fancier output. All of the graphics support available on the PC has

been added to the mainframe version, including support for the HP LaserJet printer, Encapsulated Postscript file format, and the like.

These various improvements do come at a cost. The standardization of many components of SAS means that coding practices learned in SAS 76 may no longer work. The TITLE statement now requires the quotes rather than just giving a warning when they are missing, and many procedures have new syntax. One change that may be of concern locally is that the procedure interface has been reworked to allow for the new dataset functions. While SAS-supplied procedures have been rewritten to accommodate this, user-supplied procedures for Version 5 will not work. This means that the SUGI supplemental library is obsolete. This state of affairs is not as bleak as it may seem. The SAS Institute analyzed the use of the supplemental library and has attempted to duplicate the popular functions in existing or new supported procedures. An updated facility for writing procedures will be available sometime this year, so current procedures may be rewritten by their authors. Users of the SUGI library should contact UTCS to determine if their favourite procedures have been incorporated in the new version.

SAS Version 6.06 for VM and MVS is just the beginning of a series of new versions for SAS. Version

6.06 for VMS has been announced for the same time, and there is to be a "maintenance" version of SAS for the PC soon. PC SAS Version 6.04 will have the new statistical procedures and the enhanced dialog manager, and will be the last version of SAS to run in standard DOS. Apparently the SAS Institute has given up trying to shoehorn SAS into 640KB, so subsequent releases will require either Microsoft Windows or OS/2 to run. It is not clear when these releases will be available, but it is believed that Version 6.08 for OS/2, PC-DOS with Windows, and the mainframes will be shipping early next year. The next version of SAS to be supported under UNIX will be 6.07, available in the fourth quarter of 1990, including all of the above enhancements plus a new facility called SAS/Insight, an exploratory data analysis package similar to JMP for the Macintosh. SAS for the new IBM RISC System/6000 PowerStation is also expected late this year.

UTCS will attempt to keep up with all of the new releases of SAS, but realizes that it will take time for our user groups to examine the changes inherent in the new software. We expect the current and new versions of SAS to run on the mainframe for some time, and encourage our users to contact us with any concerns or problems. For further information on SAS, please contact Barry Lay at 978-6509.

PHASER – An Animator/Simulator for Dynamical Systems (for IBM PC)

Andrzej Pindor
apindor@vm.utcs.utoronto.ca

In the last few years, several MS-DOS-based packages designed for studying dynamical systems have appeared. Chaos in the Classroom, reviewed in *ComputerNews* #258, and available from UTCS under an inexpensive site license agreement, is an educational package; Dynamical Software, reviewed in *ComputerNews* #252, is designed for research. A new addition to this group of packages is **PHASER**, a program that will appeal to all people interested in dynamical systems, from freshmen to researchers.

Scope of the Program

PHASER allows you to investigate numerical solutions to first-order differential and difference equations. You can investigate systems of up to four such equations, their dependence on initial conditions and on the parameters. You have a choice of three solution algorithms: Euler, Improved Euler, and fourth-order Runge-Kutta; you can also vary the step size at will.

Geometrical representation of the solutions, with the help of fairly sophisticated graphics, is a primary tool of an investigation. You can follow the progress of solutions as functions of time, visualize phase-

space trajectories or their projections for more than three dimensions, and construct Poincare maps for an arbitrary plane.

Operation of the Program

The program is menu-driven. I do not have room here to describe in detail all the menu choices available to you, so I will concentrate on the most important features of the program. When the program starts up, you are presented with the screen shown in *Figure 1*. This screen is split into three functionally-independent sections: the menu, the message line, and the viewing area.

The vertical region on the left shows the menu choices available to the user. To make a choice, you type the first letter of the entry. Hitting the <ENTER> key is not necessary.

At the bottom of the screen is the message line, a thin horizontal rectangle which contains the prompt "Make a choice: _". The message line displays user-supplied information as it is being entered and, when appropriate, presents error messages and many other helpful prompts. During a computation, it contains a growing bar that monitors the computation's progress.

The portion of the screen that contains the two large windows is called the viewing area. When you start up PHASER it shows two views: Phase Portrait view and Set Up view. Phase Portrait view displays, by default, phase-space trajectories in the x-y plane in the area bounded by x-values between -14.0 and 14.0, and y-values between -10.0 and 10.0. You can change the boundaries by using the "WindoSize" entry of the menu. In Figure 1, the Phase Portrait view shows five phase-space trajectories. They correspond to five different initial conditions for a set of two differential equations which exhibit Hopf bifurcation.

Set Up view displays the current values of many things: the name of the equation, the current dimension, and the solution algorithm (line 1); the values of the parameters (line 2); the boundaries of the time interval for which the solutions will be plotted (line 3); step size and the number of steps between plotted points (line 4); assignment of dependent variables to three coordinate axes: x, y and z (line 5); equation of the Poincare Plane (line 6); and the current values of the initial conditions (line 7 and following). All of these values (except axis assignment and Poincare Plane definition, which are controlled

through the VISUALAID and UTILITIES menus, respectively) can be changed by choosing the appropriate entry from the menu. To see more than two sets of the initial conditions, the Set Up window has to be enlarged, as explained in "Two Views," below.

Depending on what you want to do, PHASER offers you a choice of three main menus: the NUMERICS menu, the UTILITIES menu, and the VISUALAID menu. The Go entry from the NUMERICS menu starts the computation of solutions, Clear erases old trajectories from the Phase Portrait window, Xtend extends the computation of solutions for additional time intervals, and Orbit calculates trajectories for both positive and negative times. The Equation entry allows you to choose the difference or differential equation you wish to solve. (PHASER has an extensive collection of equations which illustrate various aspects of dynamical systems behaviour. The manual gives references to handbooks and original papers where these equations and their solutions are discussed in detail). You can also add your own equation (see "Ad/DelEqn," below). The remaining menu entries – UTILITIES and VISUALAID – lead to the two other main menus.

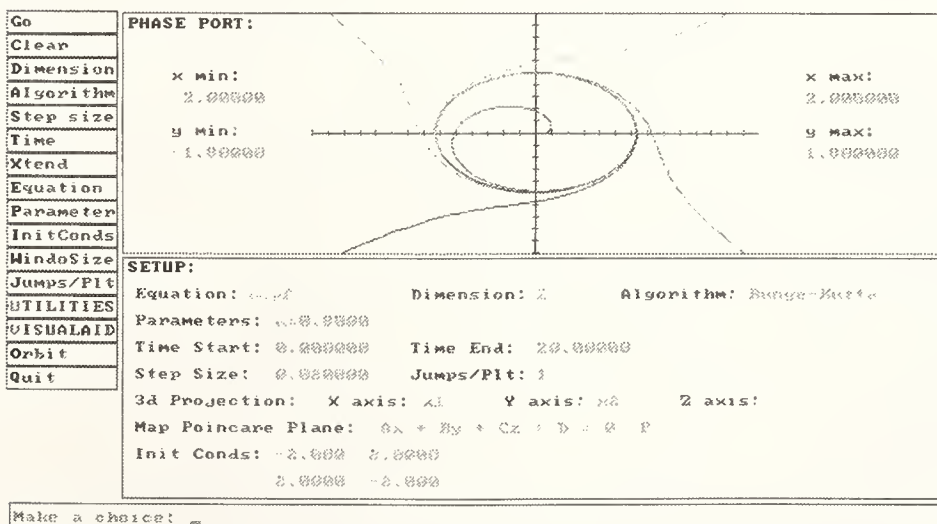


Figure 1:
Start-up view
of the screen
when entering
PHASER. The
numerics
menu is seen
on the left.

Figure 2 shows the UTILITIES menu, plus the windows in which we are analyzing a one-dimensional difference equation, specifically the logistic equation. The upper view shows 1d stairs. ("1d stairs" is a somewhat unfamiliar term that refers to a graphical way of presenting the solution to a difference equation.) The lower view shows successive iterated values of x_i . The menu entries on the left offer you the following options:

TwoViews

This entry allows you to choose what is being displayed in the upper and lower portions of the viewing area. We have already seen Phase Portrait view and Set Up view in Figure 1, and 1d Stairs and X_i vs. Time in Figure 2. (In the case of a difference equation we have, of course, a discrete index instead of a time variable.)

Big View

This option replaces two viewing areas with one big view as seen in Figure 3.

Flow and Dir Field

Available for two dimensions only, these are exploratory tools for getting a general idea about what you can expect from the solutions.

Map Poinec

This option draws the Poincare map (see "Set Up view," discussed previously).

Save

This option saves the current window configuration and all current settings in a user-specified file.

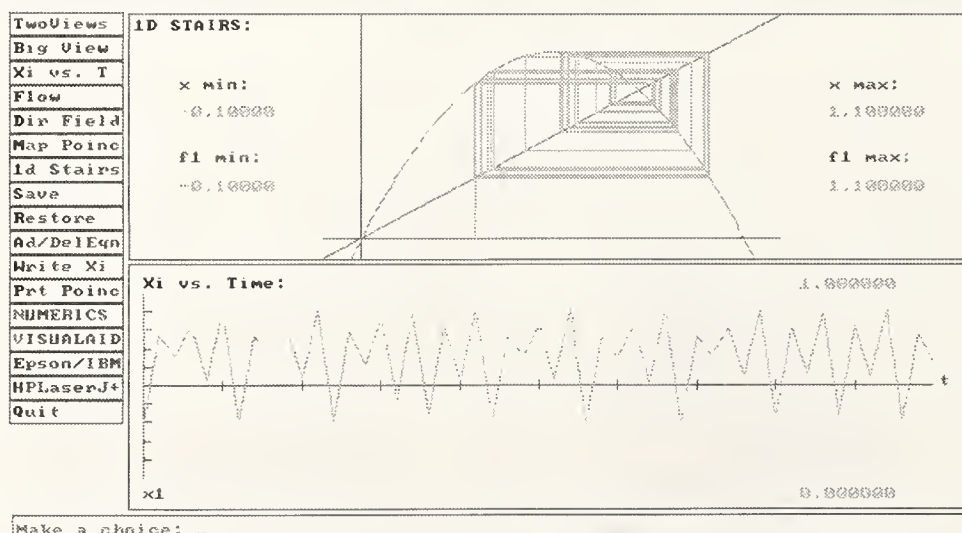
Restore

This option plays back a transcript from an existing file created using Save. Together, Save and Restore enable instructors to prepare electronic lectures for classroom demonstrations.

Ad/DelEqn

This option is used for adding or deleting user-defined equations from PHASER's library of equations.

Figure 2: The main windows show 1D Stairs (upper view) and time evolution of the solution (lower view). The Utilities menu appears on the left.



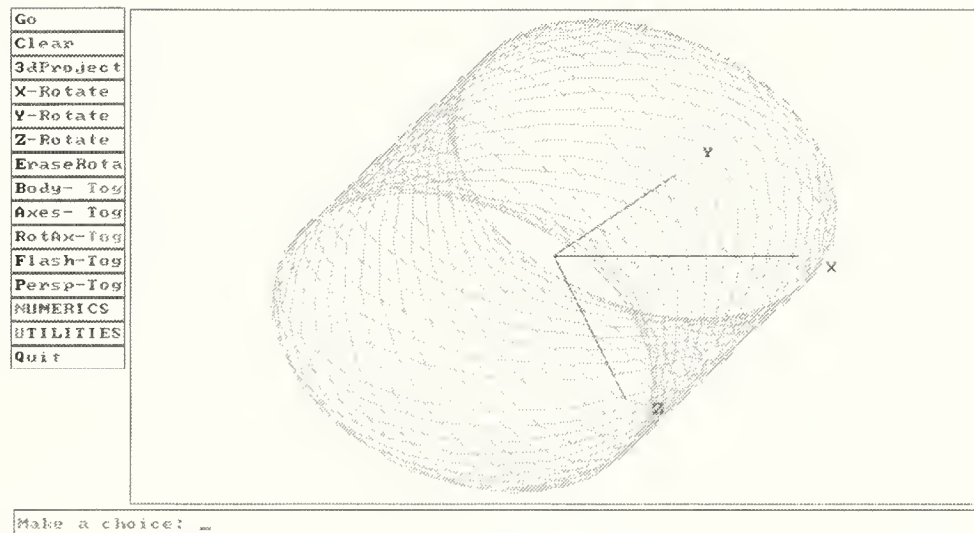


Figure 3: Phase-space portrait of the coupled harmonic oscillators (Lissajous figure). Big View option has been selected. On the left you can see the Visual Aid menu.

Write Xi

This option writes computed values of all variables x_i to a user-specified file.

PrtPoinc

This option prints or writes computed values of a Poincare map to a user-specified file.

Epson/IBM and HPLaserJ+

This option sends the screen dump to one of these printers. (These options did not work on the Zenith AT I was using.)

Figure 3 shows the VISUALAID menu, with the viewing area displaying a Big View of a Lissajous figure rotated in x-y-z space. This is a three-dimensional projection of a phase-space trajectory of a pair of harmonic oscillators. It is a complicated process to examine a three-dimensional or four-dimensional phase-space trajectory on a two-dimensional screen, so the VISUALAID menu offers you a variety of techniques to facilitate this task. You have a choice of orthographic projection, which is the default setting, or one-point perspective projection (Persp-Tog menu entry). For a four-dimensional case, you can

decide which three of the four axes are to be projected onto the x, y, and z axes of three-dimensional space (3dProject entry), and you can rotate images around any of the three axes (X-Rotate, Y-Rotate, and Z-Rotate). PHASER prompts you to enter a value for the rotation angle.

In general, I think that PHASER is a very useful program, great for learning about dynamical systems and for exploratory work on a specific dynamical system you may encounter in your research. PHASER was written by Huseyin Kocak of Brown University during the process of developing a new course in the Division of Applied Mathemat-

ics. At present, it is being distributed by Springer-Verlag, together with a well-written manual that contains a good list of references to books and articles about differential and difference equations.

PHASER is not entirely problem free, however. To me, the main drawback of the program is the lack of parameter space graphs, such as bifurcation diagrams. The program also seems to be very sensitive to the level of IBM compatibility of the microcomputer on which it is being run. In the past, I have run other programs on a Zenith AT and did not have any compatibility problems. When I was using PHASER,

however, the Zenith occasionally would hang up and have to be rebooted when I made a certain combination of menu choices. On a true IBM micro I had no problem when I made the same choices. Additionally, on a few occasions during trajectory computation, the program would either hang or exit to DOS with the message "Division overflow." The problems mentioned, however, occurred infrequently. When you consider the price, the program is a real bargain.

For more information about PHASER, call Andrzej Pindor at 978-5045.

Vendor :

Springer-Verlag
175 Fifth Avenue
New York, New York 10010
U.S.A.

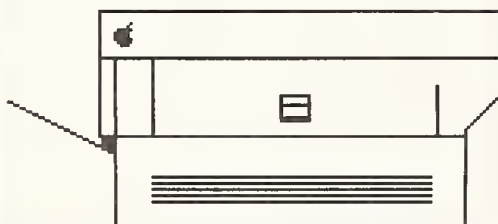
Hardware requirements:

- IBM PC, XT, AT or PS/2;
- DOS 2.0 or higher;
- 256K of RAM;
- CGA, EGA or VGA graphics adapter;
- Colour monitor (it will run on monochrome but some colours, such as red, may be invisible).

Price:

US\$49.95 (includes manual and program)

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NETLIB - A System for Distribution of Mathematical Software by Electronic Mail

Andrzej Pindor
apindor@vm.uts.utoronto.ca

The development of computer networks connecting thousands of sites around the world, which established a new mode of information exchange, also had a great impact on the distribution of computer software. A number of computer sites now collect non-commercial computer software and distribute it to any interested person.

Below, I shall briefly describe NETLIB: a system for the distribution of mathematical software by electronic mail. NETLIB provides quick, easy, and efficient distribution of public-domain software to the scientific community on an "as-needed" basis. To access this software, you must be able to send and receive electronic mail.

Software available from NETLIB is organized in the following areas:

a	- approximation algorithms (almost empty, but soon to grow)
alliant	- set of programs collected from Alliant users
apollo	- set of programs collected from Apollo users
benchmark	- various benchmark programs and a summary of timings
bihar	- Bjorstad's biharmonic solver
bmp	- Brent's multiple precision package
cheney-kincaid	- programs from the text <i>Numerical Mathematics and Computing</i>
conformal	- Schwarz-Christoffel codes by Trefethen; Bjorstad and Grosse
core	- machine constants, blas
domino	- communication and scheduling of multiple tasks; University of Maryland
eispack	- matrix eigenvalues and vectors
elefant	- Cody and Waite's tests for elementary functions
errata	- corrections to numerical books
fishpack	- separable elliptic PDEs; Swarztrauber and Sweet
fitpack	- Cine's splines under tension
fftpack	- Swarztrauber's Fourier transforms

Software available from NETLIB continued

fmm	- software from the book by Forsythe, Malcolm, and Moler
fn	- Fullerton's special functions
gcv	- Generalized Cross Validation
go	- "golden oldies" (gaussq, zeroin, lowess, etc.)
graphics	- ray-tracing
harwell	- MA28 sparse linear system
hompac	- nonlinear equations by homotopy method
itpack	- iterative linear system solution by Young and Kincaid
lanzcos	- Cullum and Willoughby's Lanczos programs
laso	- Scott's Lanczos program for eigenvalues of sparse matrices
linpack	- gaussian elimination, QR, SVD by Dongarra, Bunch, Moler, Stewart
lp	- linear programming
machines	- short descriptions of various computers
matlab	- software from the MATLAB users' group
microscope	- Alfeld and Harris' system for discontinuity checking
minpack	- nonlinear equations and least squares by More, Garbow, Hillstom
misc	- everything else
na-digest	- archive of mailings to NA distribution list
napack	- numerical algebra programs
ode	- ordinary differential equations
odepack	- ordinary differential equations from Hindmarsh
paranoia	- Kahan's floating point test
pchip	- hermite cubics Fritsch and Carlson
picl	- portable instrumented communication library for multi-processors
pltmg	- Bank's multigrid code; too large for ordinary mail
polyhedra	- Hume's database of geometric solids
port	- the public subset of PORT library
pppack	- subroutines from de Boor's Practical Guide to Splines
quadpack	- univariate quadrature by Piessens, de Donker, Kahaner
siam	- typesetting macros for SIAM journal format
slatec	- machine constants and error handling package from the Slatec library
sparse	- a set of C codes for sparse systems of equations
sparspak	- George and Liu, sparse linear algebra core
specfun	- transportable special functions
toeplitz	- linear systems in Toeplitz or circulant form by Garbow
toms	- collected Algorithms of the ACM
y12m	- sparse linear system (Aarhus)

The software can be obtained from NETLIB@ORN.LGOV. For instance, to get a more detailed description of NETLIB software you should send the following mail to NETLIB@ORN.LGOV: "send index". Together with a description of the contents of the above-mentioned libraries, you will get instructions for accessing the programs they contain.

A large proportion of the programs in NETLIB libraries are written in FORTRAN (some in C) and can be compiled on microcomputers. If you do not have access to electronic mail, we can assist you in accessing the required software from NETLIB.

Another NETLIB library is supported on the RESEARCH.ATT.COM node and can be accessed in a similar manner. The bulk of the software available is the same on both but there are some differences. For instance, NETLIB@RESEARCH.ATT.COM has a special area for C routines and for f2c area-containing programs which automatically translate FORTRAN code into C code. Send mail ("send index for c" or "send index for f2c") to NETLIB@RESEARCH.ATT.COM to receive more detailed information.

As a word of caution, it should be noted that the NETLIB software is distributed with the philosophy: "Caveat receptor. Anything free comes with no guarantee." In practice, the NETLIB software can be divided into two groups. There are well-established libraries, such as EISPACK, LINPACK, FISHPACK and few others, which are probably as bug-free as you can get. The rest come from a variety of sources; most are excellent, but you should exercise caution. For further information about accessing NETLIB, contact Andrzej Pindor at 978-5045.

QUATTRO PRO: A Quick Assessment

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I have always been afraid of numbers, particularly large lists of numbers, so it's not surprising that I was never really interested in spreadsheets. Oh, I've read articles about them, installed high-resolution device drivers for them, configured printers and plotters for them, but I have never actually used a spreadsheet.

Last October, I received an invitation to attend a product launch for Borland's new spreadsheet: **Quattro Pro**. The invitation promised a complementary copy of the program and breakfast to all attendees. I attended.

The presentation was interesting, the program appeared full-featured, and the price was attractive. (Quattro Pro is available, at its educational pricing, for US\$69.95 plus shipping.) What struck me most during the presentation was that the salesman seemed to be having fun. I began to wonder if working with Quattro Pro would help me to enjoy working with numbers.

Starting at Zero

First, I had to install and learn the program. Installing Quattro was accomplished using an INSTALL utility that came with the package. The default values for the program worked fine. Since installation of all the fonts would have taken about an hour, I chose to install only a few Bitstream fonts.

Quattro has the ability to operate with either its own menus or with

menus that look like Lotus 1-2-3. I tried both, but preferred the Quattro menus. Better organized and easier to use, Quattro also supports a mouse directly, unlike Lotus 1-2-3 which requires third-party drivers.

Never having designed a spreadsheet before, I consulted the documentation for help. I found three manuals: *Getting Started*, *Users Guide*, and *@Functions and Macros*. *Getting Started* was 167 pages long and had a helpful table of contents, as well as a good index. There was a chapter called "Quattro for Lotus 1-2-3 Users." I didn't read it. There was also a chapter on "What's new in Quattro Pro." Everything was new as far as I was concerned, so I didn't bother reading that either. The last chapter was a nine-lesson tutorial. I skimmed the first two lessons trying things out as I went and found the practice material easy to understand. Though I didn't follow the lesson step-by-step, I did not encounter any problems either. All this took about three or four hours to complete. Now I was ready to try out Quattro Pro for the project.

Applying Quattro Pro

Usually our office uses Excel or Lotus 1-2-3 to prepare spreadsheets. When a client asked us to help them plan for upgrading their current generation of computer equipment, I made an exception and used the opportunity to try Quattro Pro in a real world situation.

At first glance, our client's project

looked simple. The old PC and XT class machines needed to be replaced with faster central processing units and larger hard disks. But there were other issues to be considered as well. Several people, for example, needed to work with the same information, thus productivity would be improved if the data could be shared electronically. As the amount and importance of the information stored on the hard disks increased, provisions for simple and reliable backups had to be made. Some staff members had a need to access administrative or outside database mainframe services. Planning for easy network connectivity is an issue. Finally the cost of acquiring and maintaining the system needed to be kept as low as possible.

With these factors in mind, I set about developing 4 models. The first model showed the cost of replacing the existing computers with stand-alone machines. The second model showed the cost of replacing the existing machines with

computers on a network. The third model added the cost of access to outside electronic information sources to the stand-alone model (first model). The fourth model added the cost of accessing outside electronic information sources to the cost of the network model (second model). These models were then priced according to various vendors' rates.

With 7 different vendor packages and 4 models, there are 28 bottom line figures to compare, not including a couple of dozen other subtotals.

Organizing the Numbers

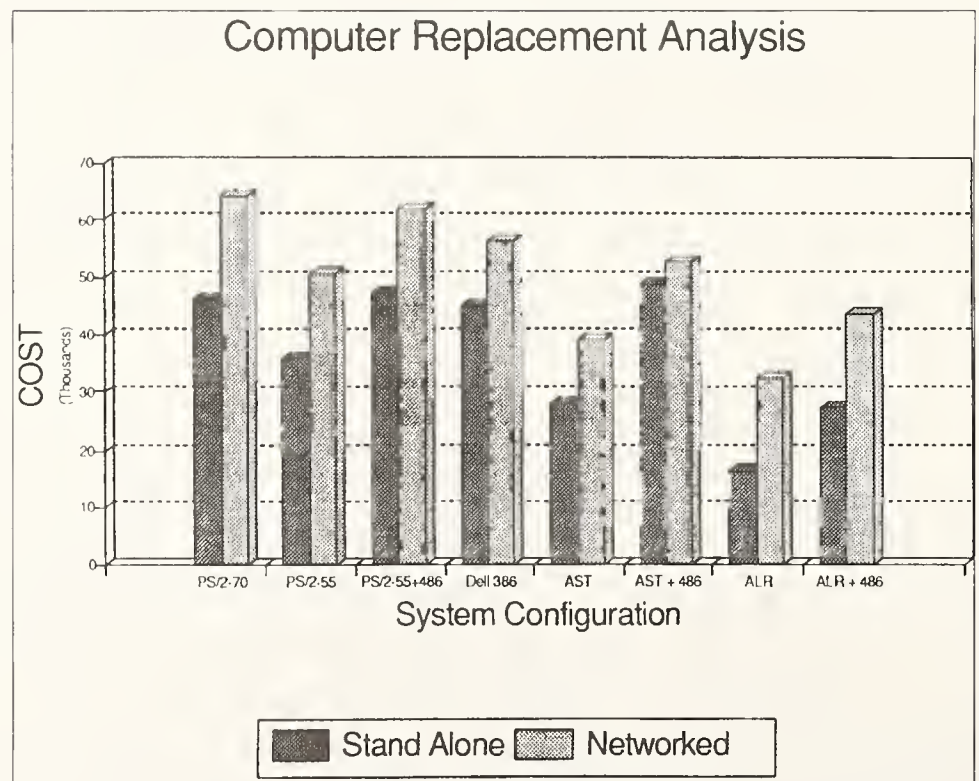
My first attempt at laying out the spreadsheet went horizontally across the page, with a column of descriptive text and a column of associated numbers for each configuration. Printing, however, took up fifteen sheets of paper. Half an hour later, working with scissors and tape, I

produced a spreadsheet the size of a table cloth.

The problem, I found, was that the default text size for Quattro was 18 points. The result was beautiful clear text that could be read by a spy satellite. So under the STYLE menu, I found the option for FONT. Using the mouse, I selected the EDIT FONT option and changed the text size to 6 points. Under the PRINT menus, I set the paper orientation to LANDSCAPE, adjusted the margins, and printed again. This time, the spreadsheet took up only four sheets of legal paper.

At this point, it occurred to me that I needed to change my approach. I laid out the data on four separate letter-size pages in LANDSCAPE orientation. Moving the data around with the mouse was easy once I got the hang of it. Before I got the hang of it, I managed to erase the entire spreadsheet twice. My recommendation is to make a copy of your good file and work on the copy until you get used to the program.

*Figure 1:
Illustration of
Quattro Pro's
bar graph
feature.*



Stand Alone		Coprocessor	0	0	0	
Mono VGA Display PC-DOS 4.01 Mouse	278	PS/27-70-E61	PS/27-70-061	PS/27-70-A61		
	150	Speed 16Mhz	Speed 20Mhz	Speed 25Mhz		
	95	RAM = 2M	RAM = 2M	RAM = 2M / Cache		
		Hard disk = 60M	Hard disk = 60M	Hard disk = 60M		
		5143	5948	8248		
Number of units		0	8	0		
PS/2 70 16mhz		0	PS/2 70 20mhz 47584	PS/2 70 25mhz 0	Total Cost	47584
Number of units		8	0	0		
PS/2 70 16mhz		41144	PS/2 70 20mhz 0	PS/2 70 25mhz 0	Total Cost	41144
Number of units		6	0	2		
PS/2 70 16mhz		30858	PS/2 70 20mhz 0	PS/2 70 25mhz 16496	Total Cost	47354
Number of units		0	6	2		
PS/2 70 16mhz		0	PS/2 70 20mhz 35688	PS/2 70 25mhz 16496	Total Cost	52184
Network System						
Novell Netware 2.15 PS/2 80-111 TLC 150MB tape drive	2495	Archnet Coax	Archnet TP	Token TP	Ether Coax	
	8885	TC Archnet Card	TC Archnet Card	IBM TR Card	EtherLink Card	
	1800	TC Coax Active Hub	TC Active Hub	Media Filter		
		998	1098	IBM MSAU		
		5598	5698	11110	6990	
Total Network:		18778	18878	24290	20170	

Figure 2:
Illustration of
Quattro Pro
spreadsheet.

Although the PostScript capabilities of Quattro let me "scrunch" a lot more text and numbers onto a page than I could otherwise do with a dot matrix printer, the spreadsheet still looked pretty dull. Using the functions found in the STYLE menu, I was able to quickly enlarge the text size of the headings. By putting some headings in bold and underlining others, the spreadsheet looked professional enough to present to my client.

Pictures Tell the Story

Even though the spreadsheet looked good, the information was unclear. Flipping between the pages and looking at the various options caused confusion. It was time to experiment with the graphing

capabilities of Quattro.

The graphing functions of Quattro were all conveniently accessible from the main menu under GRAPH. The graph types supported were Line, Bar, XY, Stacked Bar, Pie, Area, Rotated Bar, Column, High-Low, and Text. I decided to create a bar graph.

Building the graph was not as easy as I thought it would be and the manuals did not help me determine the problem. Only after several hours of testing was I finally able to figure it out. The graph program expects to find the numbers to be plotted in a table of adjacent rows and column on the spreadsheet. I did not know this and had laid out the spreadsheet with text and numbers intermixed in a visually pleasing style. As a result, when I selected the row to be plotted in the

graph, I selected a lot of garbage. Frustrated and not liking the thought of laying out the spreadsheet again, I went for lunch.

There is nothing like putting a problem in the background to mull for awhile. While lunch cooked, I realized that I might be able to use Quattro's ability to link between spreadsheets to solve my problem.

Linking Spreadsheets

A quick glance at the manual showed linking spreadsheets to be very straightforward. All you needed was to enter an expression that contains the disk drive, the directory path, the filename, and the row and the column position of the spreadsheet that you want to pull the information from. I created a new

spreadsheet with four rows (one for each model) and seven columns (one for each vendor). For each row and column position, I entered the row and the column position from the original spreadsheet.

Then I went into the GRAPH menu and selected the BAR option. Defining the series to display was very easy with the mouse and menus. The program prompted me for a title of the graph and labels for both the x- and y-axis of the graph. I selected VIEW and there it was. The only problem was that the text of the data labels was too large. Fortunately, the Font menu provided an option to edit FONT. Before I sent the graph to the printer, I was able to look it over using the preview option. The results of my little experiment are shown in *Figure 1* and *Figure 2*. If prices changed from any of the vendors, then the changes from the spreadsheet would be automatically reflected in the graph.

A Quick Assessment of Quattro Pro

Quattro offers many other features that I have not worked with. There is an extensive library of functions covering statistical, mathematical, and financial operations. There are also functions for string manipulation, date and time, database access, program logic, and spreadsheet control. Furthermore, Quattro Pro claims to be fully compatible with Lotus 1-2-3, version 2.1 file formats and macros, although I did not evaluate this.

Quattro also provides the facilities to interactively select and manipulate information from either a Paradox or dBASE III/IV database. Development is under way to extend this facility to support SQL databases. This would mean that information could be combined in a spreadsheet from such diverse sources as the DB2 database on the IBM mainframe

or the fileserver down the hall.

Technically, Borland uses a programming technology called Virtual Real-time Object Oriented Memory Manager, or VROOMM. The result is that Quattro Pro will run on the less powerful machines of several years ago as well as the current generation of laptop computers. Other high performance spreadsheets, such as Lotus 3.0 and Microsoft Excel, require more powerful (i.e., expensive) computers to offer the equivalent enhanced graphic and linked spreadsheet functions.

Has Quattro helped me to overcome my fear of numbers? Well, I still don't like numbers, but I do like Quattro. I now consider it a part of my regular collection of software and enjoy using it. I highly recommend Quattro to academic MS-DOS users, particularly those whose budgets are limited to an XT-class machine or those who need a spreadsheet for their laptop.

WordPerfect 5.1 is Here!

WordPerfect 5.1 for 5.0 Users

Irene Rosiecki
rosiecki@vm.utoronto.ca

Are you planning to upgrade to WordPerfect 5.1 by the end of the year? UTCS offers an Introduction to WordPerfect 5.1 for 5.0 Users course to help you make a smooth transition to this new version of the software.

Because you already know the basics from using 5.0, we focus on how version 5.1 is different. We look at the design and appropriate use of new features, like Pull-Down Menus, Tables, and Equations.

If you are interested in attending this course, a session will be held on Friday, April 30 from 9:00 a.m. to 1:00 p.m. Contact Irene Rosiecki at 978-4565 for registration information.

What's in it for You?

Attend a free WP5.1 demonstration and see.

Thursday, April 12, 1990 2:00 - 4:00 p.m.

To register for this demonstration, contact Irene Rosiecki at 978-4565. Space is limited.

Adding Variety to Tables

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In ComputerNews #261, I explained how the incorrect use of tabs can result in a lot of "tinkering around" to get a desired text alignment in a table. Let's review some of the issues regarding tabs and then we'll explore how you can be creative with different kinds of tabs.

In the MS-DOS environment, screens use non-proportional fonts for input display; laser printers can produce proportional fonts when printing. For new users of word-processing packages, this concept is usually the first difficulty they encounter. As you enter text in WordPerfect or Microsoft Word, the results are displayed on the screen using a non-proportional font. In non-proportional fonts all characters have the same horizontal width. Thus the letter 'i' takes up as much horizontal space as the letter 'W'. Of course this is also true for typewriters. When you worked on a typewriter it was simple to align text — you just inserted the required number of blank spaces to get the desired alignment. If you do the same thing with a word-processing package, the text will appear aligned on the screen. But, if you select a proportional font and then print, the text will not align correctly.

Most word processors store the tab character as a single keystroke. This single keystroke *does not represent a specific number of spaces*. Rather it is an instruction to the word-processing package to "move" to the right until the next tab location is encountered. The actual distance moved will depend on the current tab settings and where you are in the text line when you press the tab key.

The horizontal position at which you set a tab stop is an absolute distance from the left margin and does not depend on the font used. By setting only the number of tab stops you need for a particular task, you can save yourself some keystrokes.

Almost all word processors allow several kinds of tab alignments — left, right, centre, and decimal-

aligned. One additional type, dot leaders (as in follow-the-leader), can fill the space between two columns with a series of dots, thus guiding the reader's eye.

Left-aligned tabs place the first character of the tabbed text (the left edge) at the tab position. Right-aligned tabs have the opposite effect, placing the last character of the tabbed text (the right edge) at the tab position. Centre tabs place the middle character on the tab position. Decimal-aligned tabs place the period (decimal) in a number or dollar amount on the tab position.

To set the various kinds of tabs in WordPerfect, follow these steps:

1. Just before you enter the text of the table, execute the command that displays the "tab ruler" at the bottom of your screen.
2. Use Delete EOF (<Ctrl><End>) to clear all tab settings.
3. Using the left and right arrow keys, move along the ruler and type one of L (for left-aligned), R (for right-aligned), C (for centred), or D (for decimal-aligned) at each location you would like to set a tab. If you want dot leaders between two tab positions, first enter the type of tabs you want (L, R, C, or D) then overwrite the second tab setting of the pair with a dot (period). See the pair of tabs at 6" and 7" in *Figure 1*. To delete a tab setting, position the cursor on the tab location you want to remove and press <Del>. Create only as many tabs as you need.
4. Exit from tab setting mode by pressing <F7><Enter><Enter>. If you don't exit with <F7>, all your tab settings will be lost.

Figure 1 shows a sample tab ruler from WordPerfect 5.0 with different kinds of tab alignments. The R tab setting at 7.5 inches is a right-aligned tab with dot leaders.

Figure 2 shows how these tab settings align text on the screen while Figure 3 shows the same text printed on a laser printer using a proportional font.

In Figure 2, the text in each column is separated from the next column with a single tab.

To set tabs in Microsoft Word 5.0 follow these steps:

1. First clear all existing tab settings (<Esc>, Format, Tab, Clear-all).
2. Issue the tab setting command (<Esc>, Format, Tab, Set) and press <F1>. Using the left and right arrow keys, move along the tab ruler to the location where you want to set a tab. Choose the appropriate alignment from the menu at the bottom of the screen. Word allows you to use dashes and underscores, as well as dots, for leaders. To delete an existing tab, position the cursor at the tab setting you want to delete and press <Del>. (Word 4.0 works similarly.)
3. Press <Enter> to return to text entry mode. (If you press <Esc> you will lose your tab settings.)

Unfortunately, Word does not show leaders in text entry mode but they will appear in Page Preview and when the text is printed.

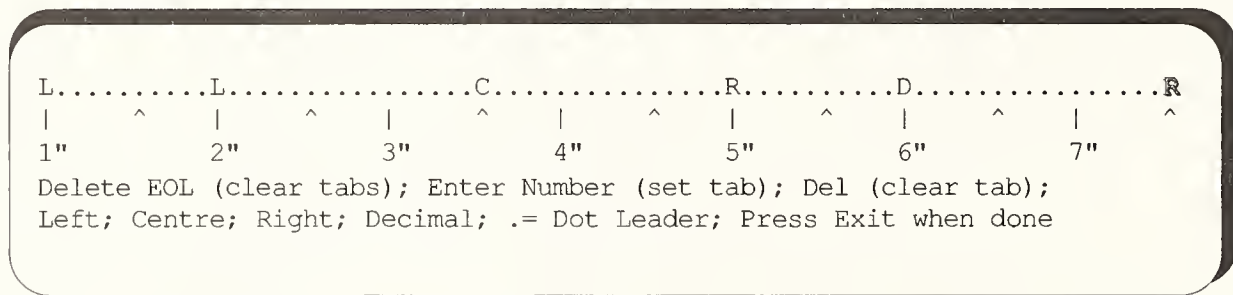


Figure 1: shows a sample tab ruler from WordPerfect 5.0 with different kinds of tab alignments.

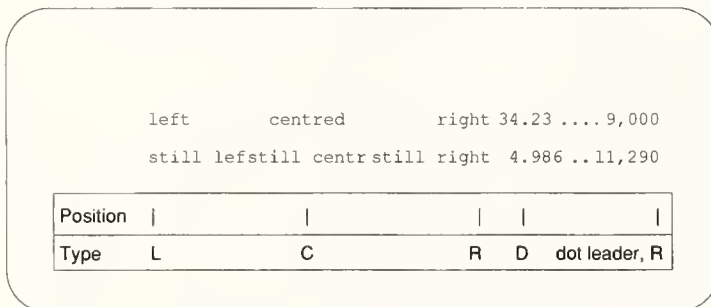


Figure 2: Sample screen text (non-proportional font).

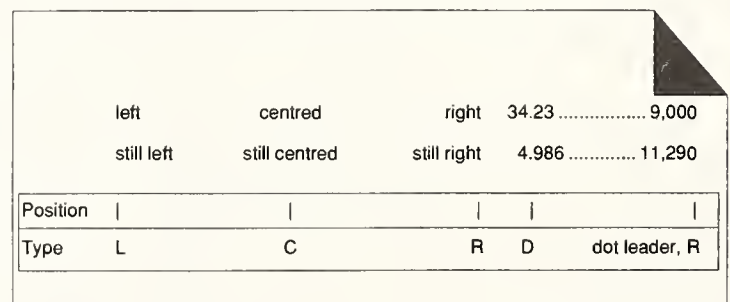


Figure 3: Sample printed text (proportional font).

Figure 4:
Sketch of
table.

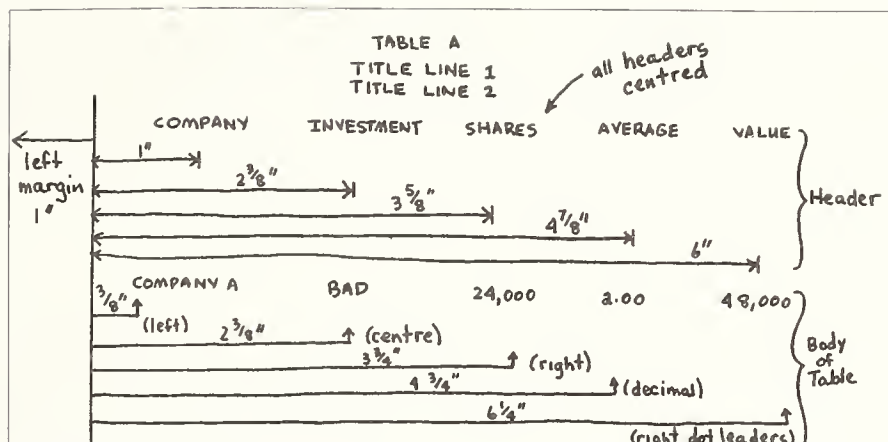


Table A
KITCHEN GADGET COMPANIES
Stock Market Profiles

(1)	(2)	(3)	(4)	(5)		
Company Name	Investment	Shares Issued	Average Price	Value		
	Risk	(,000)	(\$)	(\$)		
Kitchens 'R Us	Excellent	12,300	1.975	24,292,500		
Creative Kitchens	Fair	1,450	1.40	2,030,000		
Total Kitchen Centre	Good	670	0.875	586,250		
YK Gadgets	Fair	350	0.55	192,500		

Figure 5:
Non-pro-
portional
screen
text.

Table A
KITCHEN GADGET COMPANIES
Stock Market Profiles

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Company Name	Investment	Shares Issued	Average Price	Value
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Kitchens 'R Us	Excellent	12,300	1.975	24,292,500
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Total Kitchen Centre	Good	670	0.875	586,250
YK Gadgets	Fair	350	0.55	192,500

Figure 6:
Proportional
font laser
printer
output.

Planning a Table

Before you start entering a table, take a moment to plan it out. A little forethought will save you a lot of revision later on.

1. Start with a pencil and paper; sketch your table. Determine how many columns you will need and how you want the text in each column to be aligned. Keep in mind that the tab positions and alignment of the column titles may be different from the text within the columns. Look at Figure 4. The column heading for column 3 is centred but the numbers below it are right aligned. In a very complex table you may have to change tab settings several times.
2. With a ruler, measure the approximate distances from the left hand edge of the paper to each of the desired tab positions. Remember that the left side

of your table should start at or to the right of the current left margin setting. You don't have to be too accurate because you can always go back and adjust the settings even after the table has been entered.

3. Transfer the tab settings into the word-processing document. Remember that the tab settings precede the text to which they apply. Figure 5 shows the screen representation of the table in Figure 4. Even though the table does not look aligned on the screen, it will print correctly (as shown in Figure 6).

Understanding the different types of tabs and how to use them allows great flexibility in setting up tables.

Microcomputer Short Courses

Irene Rosiecki
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UTCS offers various noncredit microcomputer courses to faculty, staff, and graduate students of the University of Toronto. These courses cover a number of software programs available for the PC or the Macintosh. Whether you will be typing a thesis on a word processor, or working with spreadsheets, databases, or desktop publishing, we may be able to help you get started.

Our class sizes are small to allow for much individual attention. Continuing support is available upon completion of a course.

The following is a list of the microcomputer courses taught at UTCS:

- Introduction to dBASE IV
- Introduction to Desktop Publishing
- Introduction to Disk Operating System (DOS)
- Electronic Mail Seminar
- Excel on the Macintosh
- Introduction to FoxBASE+/Mac 2.0
- Introduction to HyperCard
- Introduction to Lotus 1-2-3
- Introduction to PageMaker
- ProComm Communications Seminar
- Introduction to SAS on the PC
- Intermediate SAS – Data Processing
- Intermediate SAS – Statistics
- Microsoft Word on the Macintosh
- Microsoft Word on the PC
- Introduction to WordPerfect 5.0
- Advanced WordPerfect 5.0 Topics
- Introduction to WordPerfect 5.0 for 4.2 Users

To find out about course dates and registration procedures, or to book a place in any of these courses, please contact Irene Rosiecki at 978-4565. Courses are filled on a first-come, first-served basis. The more popular courses fill up quickly, but waiting lists are maintained in case of cancellations.

Documents at UTCS

Vendor-produced documentation may be ordered through the UTCS Information Office, Room 201, 4 Bancroft Avenue. UTCS documents and selected vendor documents are also stocked there for purchase. For more information on prices, call 978-4990. Whenever feasible, documents are made available online, and users are encouraged to print their own copies. On the VM machine, a special command has been provided for this purpose.

To print online documents on:

IBM VM/CMS
Type "help document"

GP UNIX
Use *ipr* command

The following examples relate to the table below. The document to be printed is the UTCS Guide to Census Tapes, called CENSUS LISTING on CMS and /usr/doc/utcs/census on GP UNIX.

<RETURN> means RETURN or ENTER key.

CMS: document <RETURN> <RETURN>
 laser census listing (forms yxle <RETURN>)

GP UNIX: nohup ipr -8p -fyxle /usr/doc/utcs/census & <RETURN>

UTCS Documents in hardcopy

New:

UTCS Rate Schedule (Commercial)
UTCS Rate Schedule (External)
UTCS Rate Schedule (Internal)

Previously announced:

Academic's Guide to Microcomputer Systems
Character Sets for Highspeed Printing
UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction
UTCS GUIDE TO PRODUCTS AND SERVICES: Basics

Previously announced:

UTCS GUIDE TO PRODUCTS AND SERVICES: Accounting
UTCS Catalogue: Numerical Products
UTCS Catalogue: Statistics Products
UTCS Guide to Census Tapes
UTCS Guide to Kermit
UTCS Guide to Micro File Transfer Service
UTCS Guide to Text Processing on GP UNIX

UTCS Documents online

	CMS LISTING	GP UNIX	Forms Code
Recently Updated:			
UTCS Guide to Highspeed Printing	PRINT		*
UTCS Guide to VM/CMS	CMSGD		*
UTCS Guide to WScript	WSCRIPT		*
VMTAPE Messages and Codes	VMCMMSG		YXOE
VMTAPE User's Guide	VMCUSER		YXOE
Recently Removed:			
UTCS Guide to Scribe			
UTCS Guide to TFW.MAK in Scribe			
UTCS Catalogue: Text Products			
UTCS Guide to Micro Laser Printing Service			
Previously announced:			
UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction	INTRO	/usr/doc/utcs/intro	*
UTCS GUIDE TO PRODUCTS AND SERVICES: Basics	BASICS	/usr/doc/utcs/basics	*
UTCS Catalogue: Access, Part 1	ACCESS1	/usr/doc/utcs/access1	*
UTCS Catalogue: Access, Part 2		/usr/doc/utcs/access2	*
UTCS Catalogue: Numerical Products	NUMCAT		*
Product-Function List	NUMLIST		BXQD
UTCS Catalogue: Statistics Products	STATCAT		*
Product-Function List	STATLIST		BXQD
UTCS Guide to BMDP	BMDP		*

* Recommended forms code for the 8700 is YXLE unless otherwise stated.
† Use the 87set command. Type "help 87set".

Documents continued

UTCS Documents online continued

	CMS LISTING	GP UNIX	Forms Code
UTCS Guide to Census Tapes	CENSUS	/usr/doc/utcs/census	*
Recipes for Using Tapes on VM/CMS	QUIKTAPE		*
UTCS Guide to FORTRAN on VM/CMS	FORTRAN		*
UTCS Guide to GP UNIX		/usr/doc/utcs/gpunix	*
UTCS Guide to Kermit	KERMIT	/usr/doc/utcs/kermit	*
UTCS Guide to SAS	SAS		*
UTCS Guide to Series/1 Terminal Use	SERIES		*
3270 Emulation:			
Cybernex APL100 and Volker Craig VC404	CYBER		*
DM1520	DM1520		*
Hardcopy Terminal	HARDCOPY		*
IBM 3101	IBM3101		*
IBM PC Kermit	PCKERMIT		*
SOROC IQ	SOROC		*
VT52	VT52		*
VT100	VT100		*
UTCS Guide to SPSS	SPSS		*
UTCS Guide to Text Processing on GP UNIX		/usr/doc/utcs/text	YXOG

Other Documentation online

<i>Electronic Mail</i>			
A User's Guide to Electronic MAIL	MAILBOOK		YXOC
<i>Kermit</i>			
Kermit Protocol Manual	KERMITPM		YXOE
Kermit User Guide	KERMITUG		YXOF
<i>ProComm</i>			
ProComm Reference Manual	PROCOMM		YXOE
<i>VM BATCH Documents</i>			
VMBATCH User's Guide	VMBATCH		YXOA
VMBATCH Messages and Codes	VMBATMC		YXOA
<i>VMSECURE</i>			
VMSECURE User's Guide	VMSECURE		YXOE
<i>VM Tape Documents</i>			
TapeMap User's Guide and Reference	TAPEMAP		*
<i>Waterloo SCRIPT</i>			
Reference Manual	WSCRPTRF		YXLC
User's Guide	WSCRPTUG		YXLC
Using SCRIPT in MVS/TSO	WSCRPTSO		YXLC
Waterloo SCRIPT and a PostScript Printer	WSCRPTPS		YXLC
Formula Processor Summary	WSCRPTFP		YXLC
GML User's Guide	GMLUG		YXLC
GML Reference Summary	GMLRFSUM		YXLC

* Recommended forms code for the 8700 is YXLE unless otherwise stated.
† Use the 87set command. Type "help 87set".

Consulting and Enquiries

Applications Support & Advising Supervisor	Alex Nishri	BC214	978-7109
External Marketing Consultant	Ihor Prociuk	BC217	978-6875
Erindale College	Joe Lim	ER2035	828-5311
Information Office	Shirley MacLeod	BC201	978-4990
Account & Access Code Enquiries	Sylvia May	BC101B	978-7148
IBM & Macintosh Maintenance	Kam Mark	BC103	978-5050
Tape Library (Academic Services)	Susan Kovago	MP368	978-7319
Tape Library (Administrative Services)	Miranda Fong	MP368	978-6693
Communication, Networking & Hardware	Rosi Derka-Tseu	BC105	978-7087
UTCS Noncredit Short Courses	Irene Rosiecki	BC217	978-4565

Consulting & Advising Services:	978-HELP
CMS, and GP UNIX users:	ADVISOR
CMS Userid for mail problems:	POSTMSTR
Network Operations Centre	978-4621
System Status Enquiries (GP UNIX)	978-4318
System Status Enquiries (IBM)	978-7393
Interactive Services 300 (bps)	978-3959
Interactive Services 1200 (bps)	978-3959
Interactive Services 2400 (bps)	978-7239

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Managers:				
Communications & Technical Support	Norman Housley	BC121B	978-4967	norman@vm.utcs.utoronto.ca
Information Centre	Don Gibson	BC217	978-7331	don@vm.utcs.utoronto.ca
Internal Systems Support	Ron Vander Kraats	BC121A	978-4428	rvk@vm.utcs.utoronto.ca
Operations Support	Dr. Bob Chambers	MP350	978-7092	
Systems Support	Bill Lauriston	MP331	978-3579	bill@vm.utcs.utoronto.ca

Committees on Computing

Supercomputer Users' Group at U of T	Chair	Prof. W.R. Peltier	978-2938
Research Board Standing Committee on Computing	Chair	Prof. C.C. Gottlieb	978-2986

Legend

BC = Bancroft Building
ER = Erindale
MP = McLennan Physical Labs

* NetNorth/BITNET/EARN

UTCS Terminal and Advising Sites

Names and Locations

Central Advising Office (CAO), 978-HELP
 Engineering Annex (EA, CDF), 11 King's College Road, Rooms 103, 107, 107B, 201, 203
 Erindale College (Erin), 828-5339, 3359 Mississauga Road North, Erindale Campus, Rooms 2037, 2039A-B-C, 2045
 Robarts, Robarts Library, 130 St. George St., Room 1061A
 Sidney Smith (Sidney), 100 St. George St., Rooms 1071, 2105
 St. Michael's College, 121 St. Joseph St., Room 107
 Trinity College, 6 Hoskin Ave., Room 024
 Victoria University, 73 Queen's Park Cres., Room 208

Access Hours

Sites	Hours of Access				Restrictions*	Advising
	Mon-Thurs	Fri	Sat	Sun		
CAO	10:00-18:00	10:00-18:00	closed	closed	Research	978-HELP
CDF	24 hrs	24 hrs	24 hrs	24 hrs	Undergrads	No
EA	24 hrs	24 hrs	24 hrs	24 hrs	None	978-HELP for Research
Erin (2039)Δ	9:00-17:00	9:00-17:00	12:00-16:00	12:00-16:00	Research	Rm 2005
(2045-46-47)	24 hrs	24 hrs	24 hrs	24 hrs	Undergrads	Rm 2005
(235)†	8:00-22:00	8:00-17:00	closed	closed	None	Rm 2046
Robarts	8:30-24:00	8:30-24:00	9:00-22:00	13:00-22:00	None	978-HELP for Research
Sidney	7:00-24:00	7:00-24:00	7:00-24:00	7:00-24:00	None	978-HELP for Research
St. Michael's	24 hrs	24 hrs	24 hrs	24 hrs	None	978-HELP for Research
Trinity	8:00-22:00	8:00-22:00	8:00-22:00	8:00-22:00	None	978-HELP for Research
Victoria	8:30-21:00	8:30-21:00	8:00-13:00	8:00-13:00	None	978-HELP for Research

Sites Advising Hours

CAO Monday through Friday, 10:00 - 18:00
 Erin Monday through Friday, 09:00 - 22:00

Legend

- * Research includes graduates, faculty, staff.
- Δ Key access available.
- † Access restricted to building hours.

Computer and Printer Access

Sites	PACX	Printers	CDF/PC Microcomputers
CDF	N	Y	N
EA	Y	Y	N
Erin	Y	Y	N
Robarts	Y	Y	Y†
Sidney	Y	Y	Y††
St. Michael's	Y	Y	Y††
Trinity	Y	Y*	Y††
Victoria	Y	Y*	Y††

(Y=yes, N=no)

* CDF/PC only

† NEC

†† TI/PC

UTCS Services

UTCS Centrally Owned and Managed

Systems

IBM VM/CMS

Technical Assistance: 978-6602

- General Purpose Timesharing environment
- Hub of the NetNorth network with access to BITNET, EARN and the Internet
- 4381-R02 processor with 32 megabytes of memory
- CP operating system, VM/SP HPO R5
- CMS timesharing system, VM/SP Release 5
- FTP and TELNET access to the campus ethernet, as well as Internet
- RSCS spooling system, Release 2.3

GP UNIX

Technical Assistance: 978-8853

- General Purpose Timesharing under SUN UNIX 3.2
- SUN 3/280, 8 megabytes of memory
- access to Linotronic typesetter
- offers a sophisticated and powerful environment for text processing
- offers a sophisticated programming environment suitable for commercial software development or testing
- full access to USENET, an electronic technical information exchange facility
- offers excellent electronic mail facilities and ability to send or receive mail from most computer networks worldwide, such as UUCPNET, ARPANET, NetNorth, BITNET, CSNET, CDNNET

Services

Communications, Networking & Technical Support

Primary Phone: 978-7087

- Communications Group provides communications systems, terminals, modems, data channels: consulting and installation.
- Field Service Group installs and maintains communications and computer systems, particularly IBM PCs, Micro Vaxes, and Macintoshes, on a contract basis or on a cost-per-call basis.
- provides consulting on computer systems technology and installs computer systems
- provides access between the IBM systems and machines using UNIX, VMS and other operating systems. Ethernet, Pronet, and IBM TRN technologies are used over various transmission media including optical fibre. More basic communications techniques are also used for moderate speed links.
- provides consulting on local area networking and installs LANS
- provides access to NetNorth (BITNET), the North American Universities Network; ONET, the Ontario Regional Network; and USENET, the UNIX networking fraternity
- provides gateway to the US Internet
- will provide a communications solution to department needs on a contractual basis

Information Centre

Primary Phone: 978-HELP

- Provides assistance in use of electronic messaging, including use of Local Area Networks (LANS); NetNorth/BITNET/EARN, the world Universities network; CDNNET, the Canadian X.400 network; ARPANET; CSNET; USENET; and other international connections.
- provides advising, consulting and documentation on:
 - command languages, including CMS and UNIX
 - high-level languages, including FORTRAN, and C
 - packages and libraries, including SAS, SPSS, BMDP, IMSL, and NAG
 - editors and formatters, including XEDIT, ed, nroff/troff
- provides general micro support
 - selection consulting for hardware and software
 - Micro Lab for evaluation of hardware and software
 - advice on University discounts
 - media conversion and data transfer
 - CD-ROM access to software and information discs
 - offers PostScript Laser Printing Service
 - offers 35mm slide production service using Polaroid Palette
 - administers Local Area Network of PCs for Education Facility
 - administers Macintosh Education Facility
- high-quality typesetting
- provide image and typed text scanning
- installs and maintains application packages
- administers site licenses for various software packages
- provides short courses and seminars on the more popular services and software packages

The mandate of UTCS is to encourage and support the use of information technologies across campus, and to plan, implement, and operate common-carrier networks and certain appropriate central computer facilities.

Facilities Managed by UTCS

Administrative Computing

- administrative IMS, DB2, Batch, and TSO
- 3081K processor, 48 megabytes of memory
- MVS/XA operating system

Computer Disciplines Facility/UNIX

SUN 3/280s, 16 megabytes of memory (zero.cdf)

- Computer Science interactive access
- SUN UNIX 4.0.3

SUN 3/280s, 16 megabytes of memory (one.cdf)

- Computer Science interactive access
- SUN UNIX 4.0.3

Computer Disciplines Facility/PC

- 40 NEC computers connected in a Local Area Network
- 66 TI Professional Computers connected in a Local Area Network
- introductory Computer Science instruction
- MS-DOS with Turing environment

Erindale College Systems

VAX 8200, 8 megabytes of memory

- instructional access using VMS
- research access

VAX-11/750, 5 megabytes of memory

- instructional access using UNIX (Berkeley UNIX 4.3BSD)

Institutional Relations System

VAX-11/750, 8 megabytes of memory

- database services to the owner departments using VMS

EPAS Facility

- 4361-5 processor, 16 megabytes of memory
- general VM/CMS services to the owner departments

Ontario Centre for Large Scale Computation (OCLSC)

- Cray Research Inc. X-MP/24
- 2 processors, 4 megawords main memory
- solid state disk (SSD) with 64 megawords of storage
- COS 1.17 operating system
- VAX 8350 + MicroVAX II and VAX750 provide VMS front-end services

UTCS Site Licenses

UTCS administers a number of software site licenses available to the University of Toronto community. (Usually, this means faculty, staff, and graduate students, though some licenses apply to undergraduate students also. See "Restrictions" in the table below.) The licenses provide a variety of software at much-reduced cost. The majority of the licenses must be renewed each year. Most are terminated when you leave U of T.

Each license has a contract that you must complete. It outlines your responsibilities and any limitations in the use of the software. Except for ProComm, the contracts and software are available from the UTCS Information Office, 4 Bancroft Avenue, Room 201. ProComm is available from the UTCS Advising Office, 978-HELP. To qualify as a member of the U of T community, you must provide a valid Employee number or Student number.

The table below describes the available site licenses. The Restrictions column specifies who may purchase the license. If the restriction is U of T Research, the payment must come from research money. The Diskettes column describes how you actually receive the software. Large packages, like SAS and SPSS, require that you borrow the diskettes, install the software, and return the diskettes. Smaller packages, consisting of up to five diskettes, either require you to bring your own diskettes or include the costs of the UTCS-supplied diskettes in the license fee.

For more detailed information about these site licenses, telephone the UTCS Information Office at 978-4990.

Site Licenses at UTCS

Product Name	<i>Archivist</i>	<i>Chaos in the Classroom I: Maps and Bifurcations</i>	<i>Procomm</i>
System	PC; Text management	PC;	PC; Communications
Restrictions	Faculty, Staff, Graduate Students	Faculty, Staff, Graduate Students	Faculty, Staff, Graduate Students, Undergraduate
Cost	\$40	\$12	Free
License Period	One-time fee	One-time fee	N/A
Diskettes	One 5.25"; bring own	One 5.25" or one 3.5"; bring own	Two 5.25"; bring own
Documentation Available at UTCS	No	Yes	On disk; part of package
Product Name	<i>QuickMail</i>	<i>SAS/PC</i>	<i>SAS/PC network</i>
System	Mac; Electronic mail	PC; Statistical analysis	PC; Statistical analysis
Restrictions	Faculty, Staff	Faculty, Staff, Graduate Students, Undergraduate	Faculty, Staff, Graduate Students
Cost	\$25 per user	BASE/STAT/GRAPH: \$70; FSP module: \$10; IML module: \$20; ETS module: \$35.	\$35 per station
License Period	One-time fee	July 1-June 30	July 1-June 30
Diskettes	One 3.5"; bring own	Deposit \$25 per box; 6-10 boxes	
Documentation Available at UTCS	No	Yes	Yes

Site Licenses at UTCS continued

Product Name	SAS/UNIX	SPSS/PC	SYSTAT
System	UNIX; Statistical analysis	PC; Statistical analysis	Mac; Statistical analysis
Restrictions	Faculty, Staff, Graduate Students	Research	Faculty, Staff, Graduate Students
Cost	\$150 BASE; \$50 ea. FSP, IML modules	\$100	\$100
License Period	July 1-June 30	Nov 1-Oct 31	July 1-June 30
Diskettes	Tape cartridge	Deposit \$25 per box; 2-3 boxes	Five 800KB 3.5" diskettes; bring own
Documentation Available at UTCS	Yes	No	Yes
Product Name	WATCOM C	WATFOR-77	WordPerfect
System	PC; C compiler	PC; FORTRAN compiler	PC
Restrictions	Research	Research	Faculty, Staff
Cost	\$35	\$35 [\$35 WATFOR-87 (math co-processor)]; Add. \$5 GKS (Graphics Kernal System)	New: \$65 Upgrade: \$10
License Period	July 1-June 30	July 1-June 30	One time fee
Diskettes	Nine 5.25" diskettes; bring own	Included in license fee	Deposit \$25 per box; 1 box
Documentation Available at UTCS	Yes	Yes	Yes

Software List

SOFTWARE LIST for MICROCOMPUTERS

The following are microcomputer software packages for which UTCS can provide either support or some information. As with mainframe products, micro packages receive full support (Class A), limited support (Class B), or no active support (Class C). The specific criteria differ from those for mainframe classes and are outlined in the Academic's Guide to Microcomputer Systems.

Package/Compiler	Version	Environment	Support
<u>Application Development Tools</u>			
Assembler			
Microsoft Assembler	5.1	MS-DOS 3.3 & OS/2	B
MPW Assembler	2.0.2	Macintosh	B
BASIC			
GW BASIC	—	MS-DOS	B
C			
Microsoft C	5.1	MS-DOS	B
MPW C	2.0.2	Macintosh	B
WATCOM C & Express C	6.0	MS-DOS	B
Modula-2			
JPI Top Speed Modula-2	1.17	MS-DOS	B
Metacom Modula-2	1.0	Macintosh	C
FORTRAN			
IBM FORTRAN/2	1.0	MS-DOS 3.3 & OS/2	B
Language Systems FORTRAN	1.0	Macintosh	C
Microsoft FORTRAN	4.0	MS-DOS	B
WATCOM WATFOR-77	3.0	MS-DOS	A
Pascal			
MPW Pascal	2.0.2	Macintosh	C
TURBO Pascal	—	MS-DOS	B
Tools			
ResEdit	1.2d0	Macintosh	B
HyperCard	1.2.1	Macintosh	A
Macintosh Programmer's Workshop	2.0.2	Macintosh	B
SuperCard	1.0	Macintosh	B
WATCOM GKS	1.3	MS-DOS	B
<u>Communications</u>			
File Transfer & Terminal Emulators			
Kermit	0.8(35)	Macintosh	A
Kermit	2.30	MS-DOS	A
Kermit	—	Apple II DOS	C
Kermit	—	CP/M	C
DeskLink	2.21c	MS-DOS	B
Lap-Link Mac	2.0	Macintosh	B
Lap-Link PC	2.16	MS-DOS	B
MacTerminal	2.2	Macintosh	B
PC TALK3	—	MS-DOS	C
PC PLOT III	—	MS-DOS	C
ProComm	TU 2.4.2	MS-DOS	A
Red Ryder	10.3	Macintosh	B
Remote ²	1.01	MS-DOS	B
Network Systems			
AppleShare	2.0.1	Macintosh	B
Novell Advanced Netware	2.15	MS-DOS	B
STARLAN	3.1	MS-DOS	B
Tapestry II	1.1B	MS-DOS	A
TOPS	2.1	Macintosh	B
TOPS	2.1	MS-DOS	B
TOPS NetPrint	2.1	MS-DOS	B
Network System Utilities			
3COM PLUS	1.3.1	MS-DOS	B
Inter•Poll	1.0	Macintosh	B
PC LAN	1.3	MS-DOS	B

Software List continued

Package/Compiler	Version	Environment	Support
<u>Database Managers</u>			
4th Dimension	Int. 1.03	Macintosh	B
Archivist	1.02b	MS-DOS	B
AskSam	4.2	MS-DOS	B
Clipper	S87	MS-DOS	B
DATAEASE	2.5R3	MS-DOS	B
dBASE IV	1.0	MS-DOS	A
FoxBASE Mac	2.0	Macintosh	B
Notebook II	2.03	MS-DOS	C
R & R Report Writer	3.0	MS-DOS	C
<u>Desktop Publishing</u>			
Fontographer	n/a	Macintosh	C
PageMaker	3.02	Macintosh	A
PageMaker	3.0	MS-DOS	A
Quark XPress	1.0	Macintosh	C
Ready,Set,Go!	4.0	Macintosh	C
Ventura	2.0	MS-DOS	B
<u>Electronic Mail</u>			
Microsoft Mail	1.36	Macintosh	B
QuickMail	1.0	Macintosh	B
<u>Graphics</u>			
Charting			
35mm Express	4.02	MS-DOS	B
Cricket Graph	1.2	Macintosh	C
Freelance Plus	3.0	MS-DOS	B
Harvard Graphics	2.1	MS-DOS	B
Lotus 1-2-3	2.01a	MS-DOS	B
Microsoft Excel	1.5	Macintosh	B
Microsoft Excel	2.0	MS-DOS	B
SigmaPlot	—	MS-DOS	C
Draw and CAD			
Aldus Freehand	1.0	Macintosh	B
Cricket Draw	1.1	Macintosh	C
Generic CADD	3.0	MS-DOS	C
MiniCad	4.05	Macintosh	C
Illustrator	1.0	Macintosh	B
Illustrator88	1.6	Macintosh	B
MacDraft	1.2b	Macintosh	C
MacDraw	1.95	Macintosh	A
MacDraw II	1.0v1	Macintosh	B
Windows Draw	1.02	MS-DOS	C
Image and Scanning			
Corel Draw	1.00	MS-DOS	B
ImageStudio	1.05	Macintosh	B
Publish Pac	2.0	Macintosh	B
Publish Pac	2.1	MS-DOS	B
Text Pac	2.0	MS-DOS	B
Paint			
DR HALO	1.23	MS-DOS	C
MacPaint	2.0	Macintosh	A
Microsoft Paintbrush	2.0	MS-DOS	C
PC Paintbrush	2.5	MS-DOS	C
SuperPaint	1.1	Macintosh	B
Windows Paint	2.03	MS-DOS	C
Plotting Subroutines			
WATCOM GKS	1.3	MS-DOS	B

Software List continued

Package/Compiler	Version	Environment	Support
<u>Numerical</u>			
Derive	1.14	MS-DOS	C
Eispack	n/a	MS-DOS	C
Eureka	n/a	MS-DOS	C
GAUSS	2.0	MS-DOS	B
Linpack	n/a	MS-DOS	C
MathCAD	2.0	MS-DOS	C
muMATH-83	4.12	MS-DOS	C
NAG Workstation Library	Rel. 1	MS-DOS	A
Solver-Q	---	MS-DOS	C
<u>Operating Systems</u>			
IBM PC, PS/2, and compatibles			
AIX PS/2 (Unix)	1.1	n/a	C
IBM OS/2 Extended	1.1	n/a	B
IBM PC-DOS	4.0	n/a	B
Microsoft MS-DOS (incl IBM PC-DOS)	3.3	n/a	A
Microsoft Windows 286	2.1	MS-DOS	A
Microsoft Windows 386	2.1	MS-DOS	A
Macintosh II, Macintosh SE, and Macintosh Plus			
A/UX (Unix)		n/a	C
Finder	6.1	n/a	A
MultiFinder	6.0.1	n/a	A
System	6.0.2	n/a	A
NeXT			
NeXT	0.9	n/a	B
Apple II			
Apple II DOS	3.3	n/a	C
CP/M	2.20	n/a	C
ProDos	1.0	n/a	C
<u>Sound</u>			
SoundWave	1.0	Macintosh	B
MacRecorder	1.0	Macintosh	B
<u>Spreadsheet</u>			
HAL	1.0	MS-DOS	B
Lotus 1-2-3	2.01a	MS-DOS	B
Microsoft Excel	1.5	Macintosh	B
Microsoft Excel	2.0	MS-DOS	B
<u>Statistical</u>			
BASS	88.10	MS-DOS	C
MACSPIN	1.5	Macintosh	C
Minitab	82.1.1	MS-DOS	C
PowerStat	1.04	MS-DOS	C
SAS/PC	6.03	MS-DOS	A
SPSS/PC+	3.0	MS-DOS	A
STATPRO	2.0c	MS-DOS	C
STATWORKS	1.2	Macintosh	B
SYSTAT	3.2	Macintosh	B
SYSTAT	3.2	MS-DOS	B
<u>Word Processing</u>			
Guide	2.0	MS-DOS	C

Software List continued

Package/Compiler	Version	Environment	Support
MacWrite	5.01	Macintosh	B
Manuscript	2.0	MS-DOS	C
Microsoft Word	3.02 & 4.0	Macintosh	A
Microsoft Word	4.0 & 5.0	MS-DOS	A
Microsoft Word for Windows	1.0	MS-DOS	B
Nota Bene	3.0	MS-DOS	B
Nota Bene SLS	3.0	MS-DOS	B
PC-TeX	2.1	MS-DOS	B
Sprint	1.0	MS-DOS	B
WordPerfect	5.0 & 5.1	MS-DOS	A
WordPerfect	1.0	Macintosh	C
WordPerfect Library	2.0	MS-DOS	C
WordStar	3.3 & 5.5	MS-DOS	C
<u>Utilities</u>			
Apple Turnover	—	MS-DOS	A
Fastback MAC	2.0	Macintosh	B
Fastback Plus	2.0	MS-DOS	B
Norton Utilities	4.5	MS-DOS	A
Copy II MAC	7.2	Macintosh	B
Mace Utilities Gold	—	MS-DOS	B
MacZap	5.1	Macintosh	B
Sidekick for PM	1.0	OS/2	C
TURBO Lightning	—	MS-DOS	C
XenoCopy PC	1.117	MS-DOS	A
386MAX	4.0	MS-DOS	B

**SOFTWARE LIST
for
MAINFRAME
COMPUTERS
VM/CMS, UNIX**

Each programming language or package available at UTCS has a support level. In general, Class A Products receive full support, Class B limited support (as time and resources allow), Class C no active support.

For complete details of UTCS product support policy, see the UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction.

Package/Compiler	System	Support	Version
<u>Communications</u>			
FTP	VM/CMS	C	1.2.1
Kermit	VM/CMS	A	---
Kermit	UNIX	B	4C(058)
FTS	VM/CMS	A	---
MAIL/MAILBOOK	VM/CMS	A	86.359
macget/macput	UNIX	C	---
netcopy, netexec, to (NetNorth Tools)	UNIX	B	---
xmodem	UNIX	C	---
ftp,rsh,rlogin,telnet,rcp (Access via TCP/IP to most of the networked machines on all three campuses)	UNIX	B	---
rn/Pnews	UNIX	B	---
mail,mh,Mail	UNIX	-	---
TELNET	VM/CMS	C	1.2.1
<u>Graphics</u>			
PLOTBASIC (FORTRAN)	VM/CMS	C	---
SAS/GRAPH	VM/CMS	A	5.18
<u>Languages</u>			
ASSEMBLER(F)	VM/CMS	C	---
Concurrent Euclid	VM/CMS	C	1.9
FORTUTILS	VM/CMS	A	2.2
PL/I OPT Compiler	VM/CMS	B	1.5.1
REXX	VM/CMS	A	---
SNOBOL 4	VM/CMS	C	3.5
Turing	VM/CMS	C	---
VS FORTRAN	VM/CMS	A	1.4.1
VS Pascal	VM/CMS	C	2.2
Waterloo C	VM/CMS	C	1.3
WATFIV	VM/CMS	C	V2L0
WATFOR-77	VM/CMS	A	1.3
cc	UNIX	A	---
f77	UNIX	C	---
ratfor	UNIX	C	BSD std.
ttc	UNIX	C	---
pc	UNIX	C	BSD std.
yacc	UNIX	C	---
awk	UNIX	C	---
adb,dbx	UNIX	C	BSD std.
<u>Numerical</u>			
IMSL	VM/CMS	A	9.2,10.0
LINPACK	VM/CMS	C	---
MINOS	VM/CMS	C	5.1
MINPACK	VM/CMS	C	---
NAG	VM/CMS	A	Mark 11, 13
<u>Statistical</u>			
BMDP	VM/CMS	A	Level 85, Level 87
Minitab	VM/CMS	B	5.1
NAG	VM/CMS	A	Mark 11, 13
NTSYS	VM/CMS	C	1987
SAS	VM/CMS	A	5.18
SPSS*	VM/CMS	A	3.1

Software List continued

Package/Compiler	System	Support	Version
<u>Text Processing</u>			
SCRIBE	VM/CMS	C	4(1400)-1
Waterloo SCRIPT	VM/CMS	B	86.1
XEDIT	VM/CMS	A	---
8700 Pseudotypesetting	VM/CMS	C	n/a
MICROLASER	VM/CMS	C	---
ed	UNIX	A	---
vi	UNIX	C	---
cmacs	UNIX	C	---
spell	UNIX	C	---
diction/explain	UNIX	C	---
eqn	UNIX	B	---
tbl	UNIX	B	---
pic	UNIX	C	---
troff	UNIX	B	---
nroff	UNIX	B	---
TeX	UNIX	C	---
<u>Utilities</u>			
FORTUTILS	VM/CMS	A	2.2
TPRINT	VM/CMS	C	---
TCOPYNL	VM/CMS	B	---
TCOPYSL	VM/CMS	B	---
crypt	UNIX	A	BSD std.
compress	UNIX	C	BSD std.
csd	UNIX	B	BSD std.
diff	UNIX	A	BSD std.
grep	UNIX	A	BSD std.
ipr	UNIX	B	---
learn	UNIX	C	BSD std.
patch	UNIX	C	---
sed	UNIX	A	BSD std.
sort	UNIX	A	BSD std.
sh	UNIX	A	BSD std.
tar	UNIX	A	BSD std.
uniq	UNIX	A	BSD std.

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